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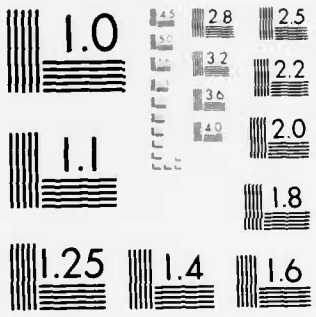

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Wright-Patterson Air Force Base, Ohio

RESUPPLY OF AIR TRANSPORTABLE HOSPITALS

Jeffrey W. Cooper, Captain, USAF

LSSR 74-83

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Air Force Medical War Reserve Materiel (WRM) Programs are being rapidly expanded to meet planned wartime activities. This research examined the various factors that impact on the wartime resupply of air transportable hospitals (ATH's), a medical WRM program. To determine what factors must be considered and their relative importance, twenty-six medical readiness experts were asked a series of thirteen in-depth questions. The respondents considered transportation the primary limiting factor, were concerned about the cost of the loss of materiel due to deterioration and expiration, addressed the shortage of trained medical materiel personnel, and expressed concern that some WRM requirements are identified but not yet funded. Recommendations were: 1) Operation Plans (OPLANS) should be used in developing resupply procedures, 2) Tables of Allowance (TA's) must be made current for modern warfare, 3) prepositioning and prestocking should be OPLAN specific, 4) the differences in perceptions as to the relative sensitivity of ATH's to surges must be resolved, 5) validated requests for WRM manpower additives must be approved, and 6) the Sets, Kits, and Outfits model developed by the Tri-Service DOD Deployable Medical Systems Standardization Project should be considered for use in determining WRM requirements.

war reserve material

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RESUPPLY OF AIR TRANSPORTABLE HOSPITALS

A Thesis

Presented to the faculty of the School of Systems and

Logistics of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirement for the

Degree of Master of Science in Logistics Management

By

Jeffrey W. Cooper
Captain, USAF

September 1983

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has been accepted by the undersigned on behalf of the faculty of the School of Systems and Logistics in partial fulfillment of the requirements for the degee of

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Purpose of the Study

This research examined the various factors that impact on the wartime resupply of Air Force air transportable hospitals. The relative importance of these factors were considered in evaluating resupply concepts.

Background

In a November, 1981, speech before the Association of Military Surgeons of the United States, former Assistant Secretary of Defense for Health Affairs, John H. Moxley, III, stated: "If a conventional war broke out today, at the height of battle, fewer than one in ten wounded U.S. servicemen would receive surgery for his wounds [8:10]."

At the present time, the Air Force Medical War Reserve Materiel Program is being rapidly expanded to meet planned wartime activities. From a total asset level of $17 million in 1979, medical War Reserve Materiel (WRM) assets will grow to $200 million in 1985 (10:6). Projections are, that by the end of 1987, medical WRM expansion costs will reach $330 million (9:11).

The seriousness of the shortfall in medical treat-

ment capability and the large amounts of money required to address the problem make it imperative that the corrective action being taken is both timely and cost effective. Medical planners must ensure that the requirements for readiness and sustainability are met.

Actions to address readiness include procuring assets such as prepositioned 500-bed hospitals, 250-bed aeromedical staging facilities, and additional air transportable hospitals. The primary focus of sustainability centers on requirements for prepositioning materiel and the composition, preparation, and location of resupply packages.

Requirements and time frames for prepositioning medical materiel are provided in the USAF War and Mobilization Plan (WMP-1), Volume 1, Annex F (17: p.15-3). Prepositioning will provide materiel for use until wartime resupply is established (19:p.1-3).

Initially, the wartime resupply function is met by resupply packages. Once units are able to submit line item requisitions, resupply package use can be discontinued (7).

Resupply packages are of particular importance to mobility assets such as air transportable hospitals (ATHs), especially since an ATH may be deployed in wartime to areas without prepositioned materiel. The quantity of consumable materiel initially provided with an ATH is intended for 30 days operations. This equates to 50% of a 60 day prepositioning policy and 33% of a 90 day prepositioning policy

(6). Therefore, the ATH must have resupply packages in order to continue functioning until line item requisitions are possible (for example, either 60 or 90 days).

Justification

Since the large increases in funding for medical WRM began in 1979, the initial emphasis has been on determining and meeting the shortfall in prepositioned assets (10). This has been accomplished through the procurement of assemblages such as 500-bed prepositioned hospitals, 250-bed aeromedical staging facilities, and improvements to existing medical WRM programs (10). Medical planners are now addressing the problem of wartime resupply of medical assemblages (2).

Before resupply of medical assemblages can be considered, medical planners first develop a medical estimate of the situation. The medical estimate is an appraisal of all factors that, from a medical viewpoint, may affect the command mission (16:p.192). Some of the factors planners consider in the medical estimate that directly impact on resupply are (16: p.192-193)

1) Proposed courses of action.

2) Characteristics of the proposed area of operations, such as climate, weather, environmental factors, and topography.

3) Personnel strength to be supported, including an estimate of battle and nonbattle casualties.

4) Total amount of medical materiel needed by weight and cube.

5) Medical materiel that will accompany deploying forces.

6) Prepositioned medical materiel that may be utilized.

7) Supply levels that deploying units should carry with them.

8) Medical supplies and equipment that are actually available.

In addition, when determining what materiel must be available on D-Day but that cannot be supported by peacetime assets (WRM), planners must consider (16: p.185):

1) Procurement lead times.

2) Production capability, both pre- and post-D-Day.

3) Transportation capability.

4) Forecast and actual dollar availability and item procurability.

5) Construction requirements for storage of WRM.

6) Industrial readiness and preparedness planning.

The relative importance of the above factors on the design of resupply packages may vary with the particular missions an ATH is expected to perform. Therefore, the resupply packages will have to be designed to meet these variations. An initial step is to examine the various factors and determine their overall relative importance in

regards to the missions of the ATH. A resupply concept can then be developed, followed by the computation of requirements, purchase of shortfalls, and the stocking or prepositioning of the materiel.

Problem Statement

Exactly how ATHs are to be resupplied during wartime has not yet been determined. Until definitive guidance is established, ATHs are vulnerable to stock outs and mission impairment in the time frame after deployment but before normal resupply is established.

Research Objective

There were two objectives to this research. One was to determine the relative importance of the factors that must be considered in developing a resupply concept for ATHs. The second objective was to evaluate, as a point of departure, two proposed concepts of resupply.

One proposal is to design the resupply package to replace what planners project will have been used prior to arrival and use of the resupply package (5). This will result in the ATH stock levels remaining at 100% (less on order/intransit). The other proposal is to design the resupply package to meet the demand rate planners expect for a specified period of time after the ATH receives the resupply package (5). Because the heaviest demands on the medical system during wartime occur at the beginning of

hostilities and then steadily decline (20:B-10), the second proposal will result in stock levels being replenished at less than 100%.

A comparison of the cost and effectiveness of the proposals will assist decision-makers in evaluating the merits of the two proposals. Either of the proposals or a combination may provide the optimum solution for the resupply of ATHs.

Research Questions

1. What factors must be considered in developing a resupply concept for air transportable hospitals for the time period between initial deployment and when normal resupply operations begin?

2. What are the strengths and weaknesses of the proposal to replace 100% of what has been used?

3. What are the strengths and weaknesses of the proposal to resupply based on expected demand?

Scope and Limitations of the Study

This research was limited to determining what factors must be considered in developing a resupply concept, the relative importance of those factors, and to the evaluation of two proposed concepts for medical resupply of air transportable hospitals.

A definitive concept of resupply was not developed, as that would have involved classified plans and was beyond

the scope of this study. However, this research provides information essential to the development of a resupply concept.

Methodology

An overview of the methodology is presented here. It is more fully developed in Chapter III. Basically, the methodology involved developing answers for the research questions by interviewing 26 medical readiness experts with a series of 13 in-depth investigative questions. The questions were of both the open ended and closed type. The interviews were conducted by telephone at prearranged times, with an average time per interview of 50 minutes. The interviews were scheduled, by telephone, at least two weeks in advance. Approximately one week before the interview, each respondent received a list of the interview questions, basic definitions, and an informative introductory letter (Appendix).

The experts selected for the interviews were personnel in medical logistics, medical planning, and medical command positions. Included were senior, experienced personnel from HQ, USAF, Office of the Surgeon General; HQ, United States Air Forces in Europe; HQ, Tactical Air Command; the Air Force Medical Materiel Field Office; the United States Army Medical Materiel Agency; the United States Navy Medical Materiel Support Command; the Defense Logistics Agency; the Defense Personnel Support Center; the

Joint Deployment Agency; and the Air Force Inspection and Safety Center. Respondent qualifications were determined by their responses to the background questions that accompanied the interview package (Appendix).

Definitions

Air Transportable Hospital (ATH): An ATH is a complete medical treatment facility designed for immediate airlift which, once unloaded at its destination, becomes fully operational within 24 hours. A more complete definition appears in the Appendix.

Medical Assemblage: A medical assemblage is a collection of supply and equipment items, both medical and non-medical, that is identified and issued as a single medical item. Examples are air transportable clinics, ATHs, and 500-bed prepositioned hospitals.

War Reserve Materiel (WRM): WRM is that materiel required in addition to peacetime assets to support the planned wartime activities reflected in the USAF War and Mobilization Plan (19:1-2).

USAF War and Mobilization Plan (WMP): The WMP is a six volume document containing all of the USAF general war and contingency planning guidance. Volumes I and III are most pertinent to medical planners. Volume I, Annex F addresses medical plans and includes taskings and formulas for estimating requirements for beds, casualties, and aeromedical evacuation. Volume III consists of two sec-

tions: mobilization and nonmobilization. The mobilization section lists active, guard, and reserve deployable medical units and availability for overseas tasking at time periods on and after the day of mobilization (e.g.: M-Day, M+1, M+10, etc.). The nonmobilization section lists only active deployable medical units and availability for overseas tasking at time periods on and after the day on which hostilities begin (e.g.: D-Day, D+1, D+10, etc.) (12:p.5-2).

CHAPTER II

LITERATURE REVIEW

War Reserve Materiel (WRM)

The basic guidance for USAF WRM is AFR 400-24. However, because of the unique nature of medical materiel, AFR 400-24 states:

> USAF medical service activities will acquire, preposition, and maintain the WRM needed to support the activities and missions of approved forces. They will compute, procure, and preposition WRM requirements according to the guidance given in the USAF WMP-1 and AFM 67-1, Volume V [19:p. 1-3].

AFM 67-1, Volume V provides the basic guidance for medical WRM programs while the WMP-1, Volume 1, Annex F provides WRM programs for each location (17:p.15-3).

The USAF Surgeon General is the USAF office of primary responsibility for implementing DOD-directed medical programs. The responsibilities include developing management policies and procedures, developing medical WRM prepositioning objectives, and developing tables of allowance for medical service wartime programs (17:p.15-3).

There are three essential concepts in AFR 400-24 (19:pp.1-2 and 1-3) that are applicable to medical WRM. These are

1. WRM requirements are based on wartime activity

from D-Day (the day hostilities begin) until either P-Day (when production can satisfy consumption) or until the end of the computational scenario for wartime, whichever comes first.

2. Prestocked WRM, generally stored in the wholesale logistics system, is designed to support forces after prepositioned assets are used (or until the end of the scenario or until production can satisfy the requirements, whichever comes first).

3. Prepositioned WRM is designed to augment peacetime consumables until wartime resupply is established. Assets are prepositioned to enhance combat closure time and to lower the level of required transportation resources during the early stages of a conflict.

To summarize, at the outbreak of hostilities both on-hand peacetime materiel and prepositioned WRM assets are used. Prior to P-Day, or when line item requisitions can be filled, whatever shortfall that exists after exhausting peacetime and prepositioned materiel is filled by prestocked WRM, which includes resupply packages.

A review of recent non-medical WRM studies was undertaken to determine if any concepts or techniques in these studies could be applied to medical WRM. Several studies (21:3;13) discussing various methodologies for determining components of War Readiness Spare Kits (WRSKs) were reviewed. Factors used in computing item quantities in

WRSK include mean time between demand, flying hour program, quantity per application, and unit cost. Since factors that impact on WRSK vary greatly from those used for casualty estimation, the methodologies are not applicable to medical needs. However, Walston found that adding, deleting, or changing quantities of certain WRSK items may cause a change in another item's demand (21:1). This interaction could also occur in a medical WRM program. For example, a reduction in the Table of Allowance quantity for 2" by 2" sponges could result in an increased demand for 4" by 4" sponges.

Factors Impacting on Medical WRM

Medical Planning

The demand rate for medical materiel depends primarily on the casualty rate (battle casualties and disease non-battle injuries) and the flow of these casualties to the medical treatment location where the materiel will be used. Briefly, the casualty rate determination considers such factors as force strength, enemy capabilities, estimated intensity of warfare, and force employment concepts. The rate is applied to the baseline strength (population at risk) to establish the expected number of casualties. This value is reduced by the number of killed in action, missing in action, and patients requiring only minor care. The remainder establishes the base workload of live patients

that impact the evacuation system and medical treatment units (20:12). Other factors that influence workload are percentage evacuated, evacuation policy, patient admission rate, the accumulation rate, and the dispersion allowance (15:5-3).

Specifically, the medical planning process begins with the medical estimate of the situation. This is prepared to plan for medical support of the operational mission of the command (16:p.192) or the tactical mission in joint operations (15:p.5-1). The medical estimate examines all factors which influence mission accomplishment. Three general steps are taken: 1) consideration of the mission, 2) consideration of the medical situation and all factors affecting health services, assumptions, workload analysis, requirements and means available, and the development of courses of action, and 3) evaluation of the various courses of action (15:p.5-1).

A detailed analysis of the situation, including medical intelligence information is essential. Some important items to be considered are (15:p.5-1)

1) Enemy Capabilities. This is the enemy's potential to inflict damage, including the use of nuclear, chemical, and biological weapons and enemy actions to impede or prohibit patient evacuation. Enemy strength, combat efficiency, position, weapons and probable movements are considered. Knowledge of enemy health conditions is im-

portant as it may affect friendly forces. Potential sources of patients may be prisoners of war, civilian internees, other persons captured or detained, and civilians.

2) Friendly Capabilities. Strength, combat efficiency, position, weapons, and plan of action of friendly forces are considered in relation to enemy capabilities.

3) Environment.

a) Terrain. Terrain directly influences medical workload. Patient evacuation depends on the availability and condition of road nets, landing strips, railroads, harbors, other geographic features, and climatic conditions.

b) Climate. Conditions such as frostbite, snow blindness, trenchfoot, sunburn, and heat prostration must be considered. Excessive precipitation interferes with patient evacuation and high humidity accelerates deterioration of medical materiel.

c) Population, customs, and disease prevalence. Disease control measures for friendly troops and civilians are influenced by knowledge of the population, customs, and prevalent diseases. Statistics on types of diseases, sources, frequency, severity, and mode of treatment are considered in estimating nonbattle patients.

d) Insects, animals, and vegetation. A knowledge of these potential sources of diseases is necessary for establishing safeguards and methods of treatment.

e) Food and Water. Inspection of food and of water are medical responsibilities.

After the situation is analyzed, a preliminary estimate is made of the number and types of patients, their distribution in time, and the areas of greatest patient density. This preliminary estimate provides a basis for calculating the number and types of medical units and the amount and kinds of medical materiel needed. Medical means are then evaluated, including medical unit availability, supplies on hand, and replenishment capability(15:p.5-2).

The next step is to evaluate the various courses of action. Once this is done, a course of action is selected and recommendations are made to the commander concerning medical support requirements and medical unit employment (15:p.5-2).

Casualties

A critical phase in preparation of the medical estimate is the analysis of strength to be supported. Once the time phased strength to be supported is determined, an estimate of nonbattle (disease and non-battle injuries) and battle casualties can be made (16:p.192).

The disease and non-battle injuries (DNBI) category includes all patients who are sick or have injuries other than those incurred in battle. Principal factors that affect DNBI are climate, geographical location, sanitation, seasoning of troops, and density of population. For exam-

ple, depending on combat intensity, United States Marine Corps (USMC) estimates are that battle casualties may average from 1.5 to over 15 times greater than those for DNBI.[1] (20:pp.B-14, B-19).

A battle casualty is considered any person lost to his organization because he is killed, wounded, missing, captured, or interned, provided such loss is incurred in action as the direct result of enemy action or sustained while engaged in combat. A significant fact is that the casualty rate is inversely proportional to the days of operation. The statistical linear correlation coefficient is very high, -0.9. Therefore, the heaviest demands on the medical system occur in the first days following the initiation of hostilities (20:B-10).

The USMC has found that there is considerable variation in casualty rates even among similar intensity conflicts. They also found an even more apparent variation of casualties within a conflict (20:B-11). One factor that causes this variation is the time the force is employed; the variation due to the fact that smaller units are not in combat in each day of a particular interval and that the intensity of combat often varies appreciably from day to

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[1] Table B-7, page B-9, Marine Corps DNBI Casualty Rate per 1,000 for ashore forces of 0.8 and Table B-10, page B-14, Marine Corps Battle Casualty Rates Relative to Conflict Intensity and Force Size, low of 1.2 and high of 12.1 per 1,000 strength per day for low, mid, and high intensity campaigns and varying force size.

day.

The estimates of DNBI and battle casualties provide the primary basis for determining admission rates. Admission rates are numerical expressions of the relative frequency that patients are admitted to hospitals from a specified population over a designated period of time. These are average rates derived from similar experiences in similar operations. Admission rates are expressed as the number of admissions to hospitals per thousand average strength per day. Thus, a rate of 4 per thousand per day means that for every thousand personnel involved, four will become hospital patients each day (15:p.5-3).

Due to variations in the individual services, the admission rate for battle injuries is broken down by service. While the DNBI rates for the services are similar, it is also broken down by service due to differences in service deployments and concepts of medical support (15:p. 5-3). Patients receive initial treatment in-theater and then are either returned to duty or medically evacuated.

Evacuation and Echelons of Care

Medical evacuation is the process of removing patients from the battlefield, and then moving them from the combat areas to hospitals for treatment or to other installations for disposition (20:B-17). The flow is from the forward to the rear areas. The extent or seriousness of a wound or injury is the determining factor in evacuation.

Over-burdened medical facilities (at various echelons of care) and the expected recuperative period are also primary factors in evacuation.

There are four specific echelons of care. However, within a theater, one or more echelons may be combined or bypassed, and functions may be expanded or contracted within echelons, as needs dictate. The echelon concept is the most effective and efficient means of providing professional medical care close to the combat area, rapidly evacuating those needing definitive treatment, and quickly returning to duty those with minor illness or injury (14:p.2-3).

The first echelon (1E) involves immediate medical care provided in the conflict area and is known as self-aid and buddy care. Care may include nerve agent antidote administration, hemorrhage control, fracture immobilization, wound protection, and limited decontamination. Assisting the injured to the nearest casualty collection point or next echelon is also necessary (14:p.2-3).

Second echelon (2E) care is provided by medical personnel at sites as close as possible to the area where casualties occur. Casualties are decontaminated, examined, receive emergency care, and their general condition is evaluated to determine the need for and priority of further treatment (14:p.2-3). Personnel who can recover in several hours are returned to duty (11:52). All other patients are evacuated to the next echelon. The objective is to rapidly

evacuate casualties to a location where definitive treatment can be provided (14:p.2-3).

The third echelon (3E) is staffed and equipped to provide specialty care and is directed toward saving life and stabilizing seriously injured casualties (14:p.2-3). Patients who can recuperate and return to duty within a specified time period (for example, 15 days) will remain. More seriously wounded patients will be evacuated to the fourth and last echelon of in-theater care (11:52).

The fourth echelon (4E) facilities provide comprehensive medical care. If patients can be rehabilitated within the time frame of the theater evacuation policy, they will remain at the 4E level until they recover. Otherwise, patients will be evacuated to the Continental United States (CONUS) for further treatment and convalescence (14:p.2-3).

With the echelons of care concept, patients move while surgeons remain stationary. This requires standardization of diagnostic and surgical procedures, rapid bodily function stabilization, procedures to prevent shock and wound infection, selective treatment due to injuries caused by different weapons, and medical evacuation support equipment (22:20).

In both Korea and Viet Nam, battlefield air evacuation by helicopter played a significant role in reducing the combat mortality rate. The speed of evacuation was an important factor in the successful treatment of the severely

wounded (20:B-18). In World War II, four percent of those wounded who were evacuated to a hospital died, in Vietnam the rate was 1.7 percent (22:20).

However, in future wars battlefield air-evacuation may be interdicted. Other factors complicating treatment and recovery would be the intense environment of continuous day and night armored combat, the use of new weapons systems and tactics with increased wounding potential, and the possibility of combined injuries from conventional, chemical, or nuclear weapons (22:20). In addition, both intra- and inter-theater air evacuation may be interdicted (22:23), placing even greater burdens on each echelon of care.

The theater evacuation policy impacts on the requirements for theater medical treatment assets in that it determines fixed bed requirements. The evacuation policy determines which patients will be evacuated to the CONUS by designating the maximum allowable number of days a patient may be hospitalized in-theater. Once theater policy is determined, within theater evacuation policy can be set for the different echelons of care. The evacuation policy has a limiting effect on the growth of patient load. Selective evacuation results in a greater savings of life, an increased number of wounded returned to duty, a decreased number of noneffective man-days, and a reduction of functional disability (20:B21).

The theater evacuation policy also directly impacts

(15:p.5-3):

1) The number and type of theater medical units required.

2) The amount of medical materiel required.

3) The amount and timing of engineering support.

4) The volume and type of transportation.

5) The rate of patient returns-to-duty.

6) The theater personnel replacement requirements.

7) The number of hospital beds required in the CONUS.

Workload Factors and Computations

For planning in finer detail, workload factors are developed and used in specific computations. For example, various computations are used to determine requirements for assets such as beds (hospitalization), aeromedical evacuation, operating tables, and the number of patients discharged (returned to duty).

Workload factors used in the computations are

1) Admission rate. As earlier described, the admission rate provides the number of personnel per thousand per day that become hospital patients. This rate is based on averages, and as such, considerable variation is possible if the size of the force involved is small or if the operation is of short duration (18:p.F-1-2).

2) Accumulation rate. There are two types of accumulation rates. The first accumulation rate measures

the number of patients who accumulate at a "steady state" under various evacuation policy periods. Accumulation rates are computed for the various policies at specified periods of time (equal to days of the evacuation policy) based on a constant admission rate of one patient per day. Separate DNBI and battle casualty (wounded in action, WIA) accumulation factors are computed because the proportion of patients admitted and the length of stay differs for the two categories. TABLE 2.1 is an Accumulation Factor Table based on USMC casualty data [2] (20:B-22). The accumulation factors are shown for different theater evacuation policies. The factors indicate how many patients will have accumulated at specified periods of time after the beginning of operations, based on a constant admission rate of one patient per day and a constant, fixed evacuation policy (20:B-22).

The other accumulation rate shows, for the number of patients admitted on any one day, the proportion of patients that will remain on each day thereafter (15:p.5-4).

3) Dispersion allowance and dispersion factor. The dispersion allowance is a measure of beds that are unavailable due to causes such as the movement of hospitals, segregation of patients of different sexes, separate wards for contagious diseases, the furnishing of complete hospital

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[2] The USMC information presented in TABLE 2.1 is now unclassified. Current USAF information can be found in the USAF War and Mobilization Plan (Secret).

TABLE 2.1
ACCUMULATION FACTORS BASED ON CONSTANT ADMISSION RATE OF ONE PER DAY

Evacuation Policy	Accumulation Factor WIA	DNBI
15	10.80	7.32
30	16.44	11.40
60	25.57	14.67
90	32.87	16.51
120	38.27	17.94

Source: U.S. Marine Corps. U.S. Marine Corps Development and Education Command. Medical and Dental Support Concept for Fleet Marine Forces (Mid-Range). Quantico, Virginia, 11 April 1973. Unclassified, Table B-21, p. B-22.

units for smaller troop units operating some distance from the main body of troops, and other factors (15:p.5-4). For example, the dispersion allowance during World War II, Korea, and the Southeast Asia conflict was 20%. However, it may be greater in future wars(18:p.F-1-2).

The dispersion factor is applied to the number of patients to obtain the number of beds required. A 20% dispersion allowance results in a dispersion factor of 1.25 (15:p.5-4).

4) Waiting time. This factor considers the time it takes to stabilize, prepare, regulate, and move a patient through the aeromedical evacuation system (18:p.F-1-2).

Specific requirements are determined using the following formulas:

1) Fixed Bed Requirement = Daily Admission Rate x Applicable Accumulation Rate x Dispersion Factor x Average Strength per Thousand.

This is computed for both DNBI and battle casualties (18:p.F-1-2).

2) Aeromedical Evacuees = Average Strength per Thousand x Daily Admission Rate x Evacuee Rate.

Workload is forecasted for all the services, using appropriate planning factors (18:p.F-2-2).

3) Operating tables are computed based on one for every six battle injury admissions per day and one for every thirty-two DNBI admissions per day (18:p.F-2-3).

4) Discharges (Returns to Duty) = Average Strength per Thousand x Daily Admission Rate x Discharge Rate (18:p.F-2-4).

SUMMARY

The USAF Surgeon General has primary responsibility for the USAF medical WRM program. At the outbreak of hostilities, both on-hand peacetime and prepositioned WRM medical stocks will be used. Prior to P-Day, or when line item requisitions can be filled, whatever shortfall exists

after exhausting peacetime and prepositioned WRM will be filled by prestocked WRM. The demand rate for medical materiel will depend primarily on the flow of DNBI and battle casualties to the specific medical treatment locations where the materiel will be used. The rate of battle casualties is inversely proportional to the days of operation. Therefore, the heaviest demands on the medical logistics system will occur during the first days following the initiation of hostilities. However, there is a considerable variation of the casualty rate within a conflict, which would be reflected in surges of patients at individual medical treatment locations. As patients flow through the evacuation system and the various echelons of care, the degree of patient care becomes more extensive. Concurrently, the requirements for a variety of medical materiel items also becomes more extensive. The battlefield and intra/inter-theater evacuation system may be interdicted in future wars. This would place additional stress on both the staffing and logistics capabilities of facilities at each affected echelon. Medical planners must consider the mission and the medical situation while preparing and evaluating various courses of action. This review concluded with an analysis of the workload factors that influence the selected course of action.

CHAPTER III

METHODOLOGY

Chapter Overview

This chapter delineates the investigative questions that were used to develop answers for the research questions listed in Chapter I. Also described are the population and sample characteristics, the data collection procedures, and the methodology used in data analysis.

Research Questions

The research questions, as described in Chapter I are

1. What factors must be considered in developing a resupply concept for air transportable hospitals for the time period between initial deployment and when normal resupply operations begin?

2. What are the strengths and weaknesses of the proposal to replace 100% of what has been used?

3. What are the strengths and weaknesses of the proposal to resupply based on expected demand?

Investigative Questions

In order to develop answers for the research ques-

tions, the following investigative questions were delineated:

1. In what type of situations will ATHs be used?

2. Which situations are more likely to occur than others, and how should these be ranked?

3. Casualty rate is inversely proportional to the days of operation (from the time of initiation of hostilities). However, there is considerable variation within a conflict (13:B-11). How sensitive are ATH supplies to localized surges in demand (within-conflict variation) and how significant a problem is this?

4. Once in place, what is the probability that the ATH will be required to move to another site based on casualty demand being higher than in the current location?

5. If the ATH can be resupplied from materiel prepositioned for other assemblages (such as prepositioned 500-bed hospitals), under what conditions and from what assemblages could this be done?

6. If the ATHs that are assigned to specific commands have "most likely" scenarios that will require unique resupply considerations, what are they?

7. If it is feasible to preposition resupply packages closer to the expected conflict area, where should they be prepositioned and who would assume responsibility for their maintenance?

8. Describe the limiting factors affecting resupply

packages and their impact on ATH resupply. Which factors are considered most critical and why?

a. Size (cube, weight)

b. Cost

c. Transportation availability (intra and inter theater).

d. Storage (location, temperature and humidity control, available space, materiel handling equipment, special storage requirements such as refrigeration, and security).

e. Additional medical logistics personnel, if required.

9. Certain scenarios may exhaust materiel quicker than others.

a. How does this relate to the limiting factors of size, cost, transportation availability, storage, and personnel?

b. Since the concern is with the period prior to the beginning of normal resupply operations, if communications are not available/reliable, how will frequency of resupply be determined?

c. If resupply packages can be "pushed" (shipped and delivered from storage site to ATH without a requisition from the ATH), how would this be done?

10. How will trained personnel, to maintain the resupply packages, be acquired for both the short and long

term?

11. Which of the two proposals, or another alternative, should be selected?

12. How much better is the alternative selected in Question 11 than the other alternatives and what criteria should be used to distinguish the selected alternative from the others?

13. Are there other pertinent factors that should be considered?

Population and Sample Characteristics

To determine the population from which to draw the sample of respondents, it was first necessary to review the objectives of the research. As stated in Chapter I, those objectives were to determine the relative importance of the factors that must be considered in developing a resupply concept for ATHs and to evaluate, as a point of departure, two proposed concepts of resupply.

Considering the objectives, the appropriate population would be medical logistics and medical planning experts from the military services and the Defense Logistics Agency. Their expertise would include experience and knowledge with either or both medical WRM and medical support planning for wartime activities.

The sample was selected in the following manner:

1) Initial contact was made with the USAF Medical Readiness Staff Officer directly responsible for designing

resupply packages for USAF medical assemblages.

2) This staff officer provided the names of individuals that he knew were experts in the areas of medical WRM and wartime medical support planning as related to medical assemblages.

3) As the experts were contacted, they were informed of the objectives of the research and asked to recommend other experts that they felt would be able to contribute to the research. This procedure lead to the identification of 29 potential respondents.

Of the 29 potential respondents, three were not included as interview subjects. Two of these were at overseas locations. Due to the difficulty and time involved in arranging and trying to complete a lengthy telephone interview, these two potential respondents were not interviewed. The third potential respondent was not interviewed as it proved impossible to arrange an interview due to this person's frequent unscheduled trips and meetings.

However, several other interview subjects had current or recent knowledge and experience similar to the three respondents who were not interviewed. While there may be a degree of sampling error due to nonresponse, it is not as significant as if the three respondents who were not interviewed had unique knowledge and experience.

The respondents included senior experienced personnel from HQ, USAF, Office of the Surgeon General; HQ,

United States Air Forces in Europe; HQ, Tactical Air Command; The Air Force Medical Materiel Field Office (AFMMFO); the United States Army Medical Materiel Agency; the United States Navy Medical Materiel Support Command; the Defense Logistics Agency; the Defense Personnel Support Center; the Joint Deployment Agency; and the Air Force Inspection and Safety Center. This list is not complete and does not provide specific addresses or office symbols as the respondents were assured of anonymity prior to the beginning of the interview.

To ensure the validity of the research and to determine respondent qualifications, each respondent provided detailed information on his or her career background. Based on their responses to the background questions (Appendix), the recommendations of other experts, and the positions these individuals occupy, this researcher concluded that the interviews provided valid and complete information. The ranks (including civilian equivalents) and the number of the respodents were four O-6's, eight O-5's, six O-4's, two O-3's, one O-2, one E-9, and one E-8. Experience averaged over 19 years.

Data Collection Procedures

Data were collected for this study by interviewing 26 experts in medical logistics and medical planning. The interview questions were based on the research and investigative questions. The questions were pretested during a

visit to AFMMFO on 21 and 22 March 1983. AFMMFO was selected because this agency has the primary responsibility for developing resupply packages for ATHs. Their staff officers are recognized experts in the medical logistics field. Two staff officers individually reviewed the questions, were interviewed, and then assisted in revising the questions, as necessary. Based on these interviews and discussions, the actual list of questions was assembled (Appendix).

Telephone interviews with the experts were conducted to collect the information. The following interview procedures were used:

1) The respondent was contacted by telephone and an appointment for the interview was arranged at least two weeks in advance. The respondent was advised that the interview would take approximately 40 minutes, although it was later determined that the actual interview length averaged 50 minutes.

2) At least one week prior to the interview, each respondent received a list of the interview questions, basic definitions, and an informative introductory letter (Appendix).

3) During the scheduled interview, each respondent was encouraged to expand on his responses to the questions and to address factors other than those appearing on the questionnaire. If the respondent did not feel qualified to

respond to a particular question, this was noted as "no opinion".

4) The interviewer took written notes to record the interview.

5) Prior to interview termination, the interviewer reviewed his notes to ensure accuracy. In some interviews, the interviewer also requested permission to quote.

Telephone Interviewing

Advantages and Disadvantages

Telephone interviews were conducted to gather data. The advantages and disadvantages of interviewing that are appropriate to this research will be briefly discussed in this section.

The telephone interview is a method of personal interviewing. The personal interview is defined by Emory as a two-way purposeful conversation initiated by an interviewer to obtain relevant information for some research purpose (4:293). The greatest advantage of the personal interview is the depth and detail of information that can be secured (4:294). Additionally, the interviewer has more control than in other interrogation types, permitting the interviewer to make adjustments in order to encourage and enhance responses. Specifically, the telephone interview has additional advantages of low cost, minimization of travel, the speed with which studies can be carried out, and a reduction of interviewer bias due to a lack of face to face contact

between the interviewer and respondent (4:305-306).

The primary disadvantage of personal interviewing is cost, in terms of both money and time (4:294). These costs are reduced by telephone interviewing. However, telephone interviews have several disadvantages, including:

1) The respondent must be reachable by phone (4:306). This disadvantage, in part, caused the elimination of two possible respondents.

2) There may be limits on the length of the interview, due to the respondents' degree of interest in the topic (4:306). This disadvantage was not a factor, as demonstrated by the average interview length of 50 minutes. Each respondent also had an advance list of questions, each considered their responses prior to the interview, each scheduled time for the interview, and each had an interest in the subject and outcome of the research.

3) The complexity of the questioning is limited (4:306). This disadvantage was not a factor as each respondent took advantage of the opportunity to review the questions and consider their responses prior to the interview.

4) It is easier for respondents to terminate a telephone interview than in a face-to-face situation (4:306). This appeared not to be a problem, as each respondent had set aside ample time for the interview and responded in detail to each question they felt qualified to

answer.

Emory identifies three broad conditions necessary for interview success (4:294-296). They are

1) The needed information must be accessible to the respondents (4:294). Since the respondents were experts in most areas of questioning, this condition was fulfilled.

2) The respondents must understand their roles. They must know what is considered relevant as an answer and how complete a response is expected (4:294). This was not a problem during the interviews.

3) The respondents must be motivated to accept their role and fulfill its requirements (4:294). The respondents appeared motivated to participate, possibly because of a desire to bring about change or encourage action that they consider desirable (4:295).

Data Analysis - General

The research questions were directed toward collecting and analyzing the ideas and perceptions of key medical logisticians and planners. The collection and generation of ideas, and the gathering and clarification of perceptions further guided the design of the investigative and resulting interview questions. Because of the qualitative, descriptive thrust of the research, rather than inferential, the measurement scales used for the interview questions were either nominal or ordinal.

With nominal scales, the value of each category

serves merely as a label for that category. Therefore, assumptions cannot be made about the relationships between the values assigned to each category. Statistical significance can be tested using the Statistical Package for the Social Sciences (SPSS) subprogram, CROSSTABS, and the resulting chi-square statistic. However, when CROSSTABS was run, it was found that for every resulting contingency table, there were cells with an expected value of less than five. This violated a condition for the use of the chi-square statistic. Thus, the chi-square statistic and the two measures based on it (coefficient of contingency, Cramer's V) could not be used to measure the strength of association. For the nominal data, FREQUENCIES was the only appropriate subprogram for use.

With ordinal scales, it is possible to rank order all categories. Because ordering is the sole mathematical property of ordinal scales, the range, which is used to measure dispersion, does not take into account the distribution of observations between the maximum and minimum values. The underlying probability distribution cannot be determined. Nonparametric statistics, therefore, were used in the analysis. The SPSS subprogram NONPAR CORR (for Spearman's Rank Correlation Coefficient) was used to measure the strength of the linear relationship between the ranks of the variables and the SPSS subprogram NPAR TESTS (for Mann-Whitney) was used to determine if the sampled populations

had identical probability distributions. The sum of rank values provided an indication of composite rankings. FREQUENCIES was also used to calculate descriptive statistics for the ordinal data.

Data Analysis - Interview Questions

In this section, each interview question is stated and then its data analysis procedures are described. The SPSS subprogram FREQUENCIES was used.

The results of the data analysis for the interview questions were used to develop answers for the research questions. Further analysis of the data is described in the following section which discusses data analysis for the research questions.

The interview questionnaire consisted of 13 questions that corresponded to the 13 investigative questions. In some instances, for interview format purposes, the interview questions differed slightly from the investigative questions.

Interview Question 1.

In what type situations will ATH's be used? Circle the appropriate situations. Please add any other situations in which you feel an ATH may be used.

a. Limited War

b. Major War

c. Rapid Deployment Operations

d. Natural Disasters

Other (please explain)

e.

f.

g.

Analysis: The total number of responses for each of the situation types was calculated. Responses classified as "other" were combined into groups based on similarity. The researcher decided how many additional groups were created and into which group the "other" responses fit. The SPSS subprogram FREQUENCIES was used to calculate the frequency of response by situation type.

Interview Question 2.

2a. By rank order, which of the situation types that you identified in Question 1. are more likely to occur than others?

RANK	SITUATION TYPE
	a. Limited War
	b. Major War
	c. Rapid Deployment Operations
	d. Natural Disasters
	Other (your definition in question one)
	e.
	f.
	g.

2b. Please explain why you ranked the situation types as you did.

2c. Do you have any other comments?

Analysis: The sum of the rank values for each of the situation types was calculated. This information, along with the number of responses for each situation type (Question 1.) was used in the comparative analysis for the research questions.

The responses to 2b. were assigned by the researcher to one of three general categories based on similarities in meanings among responses. The responses were then analyzed by the SPSS subprogram FREQUENCIES.

Additional comments were placed into appropriate existing categories.

Interview Question 3.

3a. Casualty rate is inversely proportional to the days of operation (from the time of initiation of hostilities). However, there is considerable variation within a conflict. How sensitive are ATH supplies to localized surges in demand (within-conflict variation)? Please circle the number of your response.

1. NOT SENSITIVE
2. SLIGHTLY SENSITIVE
3. MODERATELY SENSITIVE

4. FAIRLY SENSITIVE

5. HIGHLY SENSITIVE

6. NO OPINION

3b. Please explain why you selected the sensitivity category that you did.

3c. How significant do you consider the possibility of a localized surge? Please circle the number of your response.

1. NOT SIGNIFICANT

2. SLIGHTLY SIGNIFICANT

3. MODERATELY SIGNIFICANT

4. FAIRLY SIGNIFICANT

5. HIGHLY SIGNIFICANT

6. NO OPINION

3d. Please explain your response to 3c.

Analysis: The responses to 3a. and 3c. were analyzed using the SPSS subprogram FREQUENCIES.

The responses to 3b. and 3d. were assigned by the author to one of five general categories based on similarities in meanings among responses. The responses were then analyzed using the SPSS subprogram FREQUENCIES.

Interview Question 4.

4a. Once in place, what is the probability that the ATH will be required to move to another site based on casualty demand being higher than in the current location? Please circle the number of your response.

1. VERY LOW

2. LOW

3. MODERATE

4. HIGH

5. VERY HIGH

6. NO OPINION

4b. Please explain your response to 4a.

Analysis: The responses to 4a. were analyzed using the SPSS subprogram FREQUENCIES.

The responses to 4b. were assigned by the author to one of four general categories based on similarities in meanings among responses. The responses were then analyzed using the SPSS subprogram FREQUENCIES.

Interview Question 5.

Could the ATH be resupplied from materiel pre-positioned for other assemblages (such as prepositioned 500-bed hospitals)? If so, under what conditions and from what assemblages could this be done?

Analysis: Responses were grouped as to whether the individual felt that the concept was possible or not. Comments concerning conditions and assemblages were considered during analysis and in developing conclusions.

Interview Question 6.

If the ATH's that are assigned to specific commands such as PACAF, USAFE, or TAC have "most likely"

scenarios that will require unique resupply considerations, what are the scenarios and what are the unique resupply considerations?

Analysis: Comments were considered during analysis and in developing conclusions.

Interview Question 7.

Is it feasible to preposition resupply packages closer to the expected conflict area (other than CONUS)? If so, where should they be prepositioned and who should assume responsibility for their maintenance?

Analysis: Comments were considered during analysis and in developing conclusions.

Interview Question 8.

8a. Identify the limiting factors affecting resupply packages and their impact on ATH resupply. By rank order, which factors are most critical?

RANK LIMITING FACTOR

a. Size (cube, weight)

b. Cost

c. Transportation availability (intra and inter theater)

d. Storage (location, temperature and humidity control, available space, materiel handling equipment, special storage requirements such as

refrigeration, and security).

e. Additional medical logistics personnel

Other (please describe)

f.

g.

h.

8b. Please explain why you ranked the factors as you did.

Analysis: The sum of the rank values for each of the limiting factors was calculated.

The explanations were considered during analysis and in developing conclusions.

Interview Question 9.

9. Certain situations may exhaust materiel quicker than others.

9a. Using the matrix below, relate how significant each limiting factor (Question 8.) is for each situation (Question 1.). Indicate your level of concern by placing the appropriate letter (L=low, M=moderate, H=high, N=none) into the block that corresponds to each combination of situation and limiting factor.

LIMITING FACTOR / SITUATION	SIZE	COST	TRANS. AVAIL.	STORAGE	PERSONNEL	OTHER 1-2-3		
LIMITED WAR								
MAJOR WAR								
RAP.DEPL.OPS.								
NATL. DISAS.								
OTHER 1								
OTHER 2								
OTHER 3								

9b. Since the concern is with the period prior to the beginning of normal resupply operations, if communications are not available/reliable, how should resupply be accomplished?

Analysis: The sum of the rank values for each of the limiting factors was calculated and rankings were determined for each situation.

Responses to 9b. were considered during analysis and in developing conclusions.

Interview Question 10.

10a. How will trained personnel, to maintain the resupply packages, be acquired for the short term (one to three years)?

10b. How will trained personnel be acquired for the long term?

Analysis: Responses were considered during analysis and in developing conclusions.

Interview Question 11.

Considering your answers to all the preceding questions, which of the two concepts, or another alternative, would you select for ATH resupply?

Concept One: Design the resupply package to replace what has been used. This will result in the ATH stock levels remaining at 100% (less on order/intransit).

Concept Two: Design the resupply package to meet the demand rate planners expect for a specified period of time after the ATH receives the resupply package. Because the heaviest demands on the medical system historically occur at the initiation of hostilities and then steadily decline, this concept will result in stock levels being replenished at less than 100%.

Alternative (please describe)

No Opinion

Analysis: The total number of responses for each of the choices was calculated. Responses classified as "alternative" were combined into groups based on similarity. The SPSS subprogram FREQUENCIES was used to calculate the frequency response by choice type.

Interview Question 12.

12a. How much better is your selected alternative

than the other alternatives listed in Question 11.? Please circle the number preceding your answer.

1. VERY MUCH BETTER
2. SLIGHTLY BETTER
3. ALMOST EQUAL

12b. Please elaborate and describe the criteria you used to distinguish your selected alternative from the others.

Analysis: The responses to 12a. were analyzed using the SPSS subprogram FREQUENCIES.

The responses to 12b. were considered during analysis and in developing conclusions.

Interview Question 13.

Please provide any additional comments that you feel might be pertinent to this study.

Analysis: Responses were analyzed and integrated into the final two chapters (Findings; Conclusions and Recommendations) as appropriate.

Data Analysis - Research Questions

This section describes data analysis for the three research questions. Each research question is stated and then the data analysis procedures are described.

The SPSS subprogram FREQUENCIES and SPSS subprograms for Spearman's Rank Correlation Coefficient and the Mann-Whitney test were used in the data analysis.

The results of data analysis for the interview questions were used as a basis for the further data analysis that was necessary to develop answers for the research questions.

Research Question 1.

What factors must be considered in developing a resupply concept for air transportable hospitals for the time period between initial deployment and when normal resupply operations begin?

Analysis: A review of the responses to questions one through ten provided a general impression of what the respondents felt were factors that should be considered in developing a resupply concept for ATHs.

In addition, information was gained by placing the responses into the category that was selected as the concept of choice in Question 11. The grouping of responses into categories assisted in determining what factors were most important in choosing one alternative over another.

Of interest was a comparison of Questions 3a. and 3c. using the SPSS subprogram for Spearman's Rank Correlation Coefficient. The total responses were tested to provide an indication as to the strength of the linear relationship between the ranks of the variables.

The SPSS subprogram for the Mann-Whitney test was used with the ordinal data to determine if the rankings for the variable in an interview question had the same or a

different distribution for the two resupply concepts.

Research Question 2.

What are the strengths and weaknesses of the proposal to replace 100% of what has be used?

Analysis: Information to answer this question was derived primarily from the explanatory-type responses. It was predicted that strengths would include better ability to respond to variability in demand and a lower frequency of reliance on limiting factors such as transportation. Weaknesses would include high cost, higher loss through deterioration, and increased pressure on limiting factors such as storage and available personnel.

Research Question 3.

What are the strengths and weaknesses of the proposal to resupply based on expected demand?

Analysis: Information to answer this question was also derived primarily from the explanatory-type responses. It was predicted that the strengths for this proposal would essentially be the weaknesses of the first proposal, and vice versa. The most significant advantages would be lower cost and smaller size (easier to store or transport). The most serious disadvantage would be reduced flexibility to deal with surges or additional requirements.

Summary

This chapter provided an explanation of the method-

ology used to answer the interview questions, which in turn provided the information used to develop answers for the research questions. The actual analysis of the data leads to the following chapter on research findings.

CHAPTER IV

FINDINGS

Chapter Overview

This chapter presents the descriptive statistics, computed using the SPSS subprogram FREQUENCIES, for the responses to the interview questions. The tables display counts and frequencies in three categories: total responses, those who selected Concept 1 and those who selected Concept 2. An analysis of the data collected is provided for each of the research questions. The SPSS subprograms for Spearman's Rank Correlation Coefficient and the Mann-Whitney test were used to aid in the analysis of the relationships between several of the ordinal variables.

Presentation of Findings

Situation Data

Interview Question 1. TABLE 4.1 shows the situations in which the respondents thought an ATH may be used. Additional situations that were suggested by fewer than three respondents were assigned by the author to one of the six categories. The relatively lower frequencies for Exercises and Operations does not necessarily imply that the

TABLE 4.1

SITUATIONS

ATH - SITUATIONS For Use:	TOTAL N	TOTAL %	CONCEPT 1 N	CONCEPT 1 %	CONCEPT 2 N	CONCEPT 2 %
1. LIMITED WAR	26	100.0	16	100.0	7	100.0
2. MAJOR WAR	25	96.2	16	100.0	7	100.0
3. RAPID DEPLOYMENT OPERATIONS	26	100.0	16	100.0	7	100.0
4. NATURAL DISASTERS	26	100.0	16	100.0	7	100.0
5. EXERCISES	11	42.3	6	37.5	3	42.9
6. OPERATIONS	5	19.2	4	25.0	0	00.0

other respondents do not think those situations will occur, but rather that, based on their experience, they may not have considered those situations during the interview.

Interview Question 2a. The situation likelihood rankings appear in TABLE 4.2. For each situation, the rank value sum provides an indication of composite ranking. Exercises and Operations were not included in the ranking as the low number of responses may have been due to factors other than the respondents thinking the situations were unlikely. However, in all but one of the cases where Exercises and Operations were suggested, the respondents ranked them as either first or second most likely.

Interview Question 2b. The explanation of the

TABLE 4.2

LIKELIHOOD

SITUATION LIKELIHOOD	TOTAL RANK	CONCEPT 1 RANK	CONCEPT 2 RANK
1. LIMITED WAR	3	3	3
2. MAJOR WAR	4	4	4
3. RAPID DEPLOYMENT OPERATIONS	2	2	2
4. NATURAL DISASTERS	1	1	1
5. EXERCISES	5	5	5
6. OPERATIONS	5	6	6

A. SUM OF RANK VALUES GIVES INDICATION OF COMPOSITE RANKING

B. EXERCISES AND OPERATIONS NOT INCLUDED DUE TO INSUFFICIENT RESPONSES

rankings for question 2a. appear in TABLE 4.3. Responses categorized as Past Use were based on the respondents' familiarity with past ATH deployments. The Likelihood of Occurrence category resulted from respondents basing their determination on how they perceive the ATH meeting current mission requirements. Six respondents stated that knowledge of the USAF Planning Process (unclassified) determined their recommended rankings.

Surge Data

Interview Question 3a. The respondents iden-

TABLE 4.3

EXPLANATION OF SITUATION RANKING

	TOTAL		CONCEPT 1		CONCEPT 2	
RANK EXPLANATIONS	N	%	N	%	N	%
1. PAST USE	16	61.5	9	56.3	6	85.7
2. LIKELIHOOD OF OCCURRENCE	4	15.4	3	18.8		
3. PLANNING PROCESS	6	23.1	4	25.0	1	14.3
TOTALS	26	100.0	16	100.0	7	100.0

TABLE 4.4

SENSITIVITY TO SURGES

	TOTAL		CONCEPT 1		CONCEPT 2	
ATH SURGE SENSITIVITY	N	%	N	%	N	%
1. NOT SENSITIVE	1	3.8			1	14.3
2. SLIGHTLY SENSITIVE	1	3.8				
3. MODERATELY SENSITIVE	5	19.2	3	18.8	2	28.6
4. FAIRLY SENSITIVE	2	7.7	2	12.5		
5. HIGHLY SENSITIVE	15	57.7	11	68.8	3	42.9
6. NO OPINION	2	7.7			1	14.3
TOTALS	26	100.0	16	100.0	7	100.0

tified how sensitive (vulnerable) they believe ATH supplies are to localized surges in demand. The responses are presented in TABLE 4.4.

Interview Question 3b. TABLE 4.5 identifies the five categories in which the author assigned the various responses. Respondents identifying category one believe that the ATH was designed to handle unpredictable surges in casualties. Those selecting category two believe that ATH supplies represent minimal needs for average situations.

TABLE 4.5

SENSITIVITY EXPLANATIONS

	TOTAL		CONCEPT 1		CONCEPT 2	
SURGE SENSITIVITY EXPLANATIONS	N	%	N	%	N	%
1. DESIGNED TO HANDLE SURGES	3	11.5	1	6.3	1	14.3
2. NOT DESIGNED (INSUFFICIENT MATERIEL)	12	46.2	8	50.0	4	57.1
3. NOT DESIGNED (UNPREDICTABILITY OF MODERN WAR)	2	7.7	1	6.3		
4. NOT DESIGNED (VARIANCES DUE TO LOCATION AND USE)	7	26.9	6	37.5	1	14.3
5. NO OPINION	2	7.7			1	14.3
TOTALS	26	100.0	16	100.0	7	100.0

TABLE 4.6

LOCALIZED SURGE

POSSIBILITY LOCALIZED SURGE	TOTAL N	TOTAL %	CONCEPT 1 N	CONCEPT 1 %	CONCEPT 2 N	CONCEPT 2 %
1. NOT SIGNIFICANT	1	3.8				
2. SLIGHTLY SIGNIFICANT	1	3.8			1	14.3
3. MODERATELY SIGNIFICANT	5	19.2	3	18.8	1	14.3
4. FAIRLY SIGNIFICANT	7	26.9	5	31.3	2	28.6
5. HIGHLY SIGNIFICANT	10	38.5	7	43.8	2	28.6
6. NO OPINION	2	7.7	1	6.3	1	14.3
TOTALS	26	100.0	16	100.0	7	100.0

Category three respondents expressed concern that the inversely proportional casualty rate assumption may no longer be valid for modern warfare. Respondents identifying category four believe that while overall within-theater casualties may meet predictions, the casualties received at various medical assemblages may vary greatly.

Interview Question 3c. The responses displayed in TABLE 4.6 show how significant the respondents consider the possibility of a localized surge.

Interview Question 3d. TABLE 4.7 provides the explanations for how the respondents determined the signi-

TABLE 4.7

SURGE EXPLANATIONS

SURGE POSSIBILITY EXPLANATION	TOTAL N	TOTAL %	CONCEPT 1 N	CONCEPT 1 %	CONCEPT 2 N	CONCEPT 2 %
1. VARIATIONS IN CONDUCT OF WAR (ENEMY ACTION)	6	23.1	4	25.Ø	1	14.3
2. VARIATIONS IN CONDUCT OF WAR (FRIENDLY AND ENEMY ACTION)	12	46.2	9	56.3	2	28.6
3. ADVANCE PREPARATION TIME IS AVAILABLE	1	3.8			1	14.3
4. MEDICAL FACILITIES LOCATED SO PATIENTS EQUITABLY DISTRIBUTED	3	11.5	1	6.3	2	28.6
5. NO OPINION	4	15.4	2	12.5	1	14.3
TOTALS	26	1ØØ.Ø	16	1ØØ.Ø	7	1ØØ.Ø

ficance of the possibility of a localized surge. Category one respondents thought that enemy action, primarily through target priorities that may frequently change, would result in unpredictable casualty surges. Those selecting category two thought that both friendly (including other services and our allies) and enemy action would result in surges. One respondent (category three) thought that in most cases sufficient advance notification of probable casualties would provide time to increase materiel stocks. Those respondents who selected category four did so because they thought med-

ical facility distribution and theater evacuation policy would smooth the flow of casualties to the various assemblages.

Movement Data

Interview Question 4a. The respondents' perceptions of the likelihood of an ATH moving to another site once it has been established are shown in TABLE 4.8.

Interview Question 4b. Explanations for the responses in question 4a. appear in TABLE 4.9. Category one, Flow of Battle, refers not only to the battle moving so far from the ATH that its contribution to casualty care is

TABLE 4.8

ATH MOVEMENT

	TOTAL		CONCEPT 1		CONCEPT 2	
PROBABILITY OF ATH MOVE	N	%	N	%	N	%
1. VERY LOW	4	15.4	2	12.5	2	28.6
2. LOW	9	34.6	8	50.0		
3. MODERATE	6	23.1	2	12.5	3	42.9
4. HIGH	1	3.8	1	6.3		
5. VERY HIGH	3	11.5	2	12.5	1	14.3
6. NO OPINION	3	11.5	1	6.3	1	14.3
TOTALS	26	100.0	16	100.0	7	100.0

unacceptably low, but also to the probability that, in certain situations, the ATH may become subject to enemy take over if it does not move. Respondents who selected category two thought that the ATH's usual siting to support flying operations at an airfield would place it sufficiently behind the lines that the threat of enemy take over would be minimal and that the casualty flow would remain at acceptable levels. Those selecting category three thought that no matter what the situation, the ATH would not move because of the non-availability of transportation.

TABLE 4.9

MOVEMENT EXPLANATION

	TOTAL		CONCEPT 1		CONCEPT 2	
EXPLANATION FOR PROBABILITY OF MOVE	N	%	N	%	N	%
1. FLOW OF BATTLE	9	34.6	4	25.0	4	57.1
2. ATH MISSION RESULTS IN LOCATION SUFFICIENTLY BEHIND LINES	11	42.3	9	56.3	1	14.3
3. TRANSPORTATION PROBABLY NOT AVAILABLE	3	11.5	2	12.5	1	14.3
4. NO OPINION	3	11.5	1	6.3	1	14.3
TOTALS	26	100.0	16	100.0	7	100.0

Supply Source Data

Interview Question 5. TABLE 4.10 shows whether the respondents thought the ATH could or could not be re-supplied from materiel prepositioned for other assemblages.

Resupply and Prepositioning Data

Interview Questions 6. and 7. Responses to these questions were such that categorization was not appropriate. These responses were used in the research question analysis and in developing conclusions.

Limiting Factors

Interview Question 8a. The limiting factors ranking appear in TABLE 4.11. The sum of the rank values were computed and then the limiting factors ranked based on the new composite values. Other limiting factors identified by individual respondents were considered in the research question analysis and in developing conclusions. Separate tables were not provided for Concept 1 and Concept 2 because of many ties in the rankings that yielded overall ranks with little meaning.

Interview Question 8b. Responses to this question could not properly be categorized. The responses were considered in the research question analysis and in developing the conclusions.

TABLE 4.10

RESUPPLY SOURCES

	TOTAL		CONCEPT 1		CONCEPT 2	
ATH RESUPPLY FROM OTHER SOURCES	N	%	N	%	N	%
1. YES	24	92.3	15	93.8	7	100.0
2. NO	1	3.8	1	6.3		
3. NO OPINION	1	3.8				
TOTALS	26	100.0	16	100.0	7	100.0

TABLE 4.11

LIMITING FACTORS

LIMITING FACTORS RANK	TOTAL RANK
1. SIZE (CUBE, WEIGHT)	4
2. COST	5
3. TRANSPORTATION AVAILABILITY (INTRA AND INTER THEATER)	1
4. STORAGE	2
5. ADDITIONAL PERSONNEL	3

SUM OF RANK VALUES USED AS INDICATION OF COMPOSITE RANKING

Interview Question 9a. The limiting factors rankings for each situation are presented in TABLE 4.12. The sum of the rank values were computed and then the limiting factors ranked based on the new composite values. Decimal values represent ties in the rankings. There were many ties in the rankings for Concept 1 and Concept 2, yielding over-all ranks with little meaning. Therefore, separate tables were not provided.

Interview Question 9b. Responses to this question could not properly be categorized. The responses were considered in the research question analysis and in developing the conclusions.

Personnel Data

Interview Questions 10a. and 10b. Responses to these questions could not be categorized. The responses were considered in the research question analysis and in developing the conclusions.

Concept Selection Data

Interview Question 11. TABLE 4.13 shows which concept the respondents selected. Responses classified as alternatives were considered in the research question analysis and in developing the conclusions.

TABLE 4.12

LIMITING FACTORS AND SITUATIONS

LIMITING FACTORS RANK	LW	MW	RDO	ND	EX	TOTAL OPS
1. SIZE (CUBE, WEIGHT)	2	2	2	2	2	3.5
2. COST	5	5	4.5	3	3	3.5
3. TRANSPORTATION AVAILABILITY (INTRA AND INTER THEATER)	1	1	1	1	1	1.5
4. STORAGE	3	3.5	3	4	4	5
5. ADDITIONAL PERSONNEL	4	3.5	4.5	5	5	1.5

A. SUM OF RANK VALUES GIVES INDICATION OF COMPOSITE RANKING

B. DECIMALS REPRESENT TIES

C. CODE:

LW = LIMITED WAR
MW = MAJOR WAR
RDO = RAPID DEPLOYMENT OPERATIONS
ND = NATURAL DISASTER
EX = EXERCISES
OPS = OPERATIONS

TABLE 4.13

CONCEPT CHOICE

RESUPPLY CONCEPT	TOTAL N	TOTAL %
1. CONCEPT 1	16	61.5
2. CONCEPT 2	7	26.9
3. ALTERNATIVE	2	7.7
4. NO OPINION	1	3.8
TOTALS	26	100.0

TABLE 4.14

CONCEPT CHOICE RANKING

SELECTED CONCEPT RANK	TOTAL N	TOTAL %	CONCEPT 1 N	CONCEPT 1 %	CONCEPT 2 N	CONCEPT 2 %
1. VERY MUCH BETTER	11	42.3	7	43.8	3	42.9
2. SLIGHTLY BETTER	10	38.5	5	31.3	4	57.1
3. ALMOST EQUAL	4	15.4	4	25.0		
4. NO OPINION	1	3.8				
TOTALS	26	100.0	16	100.0	7	100.0

Interview Question 12a. How much better the respondents considered their concept choice as compared to the other alternatives is presented in TABLE 4.14.

Interview Question 12b. Responses to these questions could not be categorized. The responses were considered in the research question analysis and in developing the conclusions.

Interview Question 13. Responses were analyzed and integrated into the final two chapters.

Analysis and Discussion

Research Question 1

> What factors must be considered in developing a resupply concept for air transportable hospitals for the time period between initial deployment and when normal resupply operations begin?

The purpose of the phrasing and sequencing of the interview questions was to collect and generate ideas and to gather and clarify the perceptions of the respondents. These ideas and perceptions are reflected not only in the comments provided by the respondents but also in the alternatives and rankings they selected for the interview questions. Each interview question contributed to identifying factors relevant to this research question.

Situations

The responses to interview Questions 1., 2a., and 2b. provided information concerning situations in which ATH's may be used.

Question 1. was primarily intended to start the respondents thinking not only about situations but also about the ATH's ability to perform in various situations.

TABLE 4.1 shows in which situations the respondents thought an ATH might be used. The respondent who thought that the ATH was not appropriate for Major War reasoned that its relatively small size and capabilities, when compared to 250 and 500 bed assemblages, would render it insignificant. The respondent thought the ATH would provide more care than required for 1E and 2E treatment, but fall significantly short in providing 3E care. This response referred primarily to a European scenario.

Even though the ATH is a medical War Reserve Materiel asset designed to provide wartime treatment of casualties, it is significant to note that all respondents considered Natural Disasters as a possible situation and ranked it as the most likely use of an ATH (TABLE 4.2).

As mentioned previously, Exercises and Operations were not included in TABLE 4.2 because the low number of responses would inaccurately skew the data. However, those respondents who identified Exercises and Operations ranked them as either one or two.

TABLE 4.2 shows that respondents selecting Concept 1 ranked the likelihood of use for an ATH the same as those selecting Concept 2. The results of the Mann-Whitney test reinforced the rankings shown in TABLE 4.2. The null hypothesis that the two populations have identical probability distributions could not be rejected. The Mann-Whitney results were

	CONCEPT 1 MEAN RANK	CONCEPT 2 MEAN RANK	CALCULATED VALUE
LIMITED WAR	12.06	11.86	55.0
MAJOR WAR	12.31	11.29	51.0
RAPID DEPLOYMENT OPS	12.53	10.79	47.5
NATURAL DISASTERS	12.31	11.29	51.0
EXERCISES	11.81	12.43	53.0
OPERATIONS	12.87	10.00	42.0

REJECT IF CALCULATED VALUE IS LESS THAN 26.0

TABLE 4.3 shows the explanations for the situation rankings. Even though 23.1% identified knowledge of the planning process as their explanation, 18 of the respondents (69.2%) currently or have recently occupied positions which required familiarity with plans. The impression the researcher received was that the respondents who identified Past Use or Likelihood of Occurrence, yet were familiar with plans, did so because plans are not likely to include the non-combat uses for ATH's that the respondents thought were

probable.

Therefore, this research concludes that the most likely use of ATH's will be in non-combat situations, (Exercises, Operations, Natural Disasters), followed by Rapid Deployment Operations, Limited War, and Major War, respectively. These rankings raise questions concerning the difficulty of pre-positioning for ATH's (especially for the non-combat situations and Rapid Deployment Operations), the type of items selected for resupply packages, and the size of resupply packages.

Surges

Questions 3a., 3b., 3c., and 3d. and TABLES 4.4 through 4.7 consider the respondents' perceptions of the vulnerability of ATH materiel stocks to surges in casualties and their perceptions of the likelihood that an ATH would experience surges.

It is significant to note that in TABLE 4.4, 84.6% of all respondents consider stocks either moderately, fairly, or highly sensitive to surges. One hundred percent of those selecting Concept 1 and 71.5% of those selecting Concept 2 selected in the moderate to high range.

The Mann-Whitney test reinforced the impression of similarity in rankings between the two Concepts. The null hypothesis that the two populations have identical probability distributions could not be rejected. The Mann-Whitney results were

	CONCEPT 1 MEAN RANK	CONCEPT 2 MEAN RANK	CALCULATED VALUE
SURGE IMPACT	13.34	8.93	34.5

REJECT IF CALCULATED VALUE IS LESS THAN 26.0

As shown in TABLE 4.5, only three respondents thought that the ATH was designed to handle surges. Twenty-one respondents thought that the ATH was not designed to handle surges. Those who believe the design is appropriate reasoned that surges and lulls in activity were considered during ATH design and are considered during periodic reviews of the ATH Tables of Allowance.

Those who thought the design is inappropriate provided comments that were grouped by the researcher into three categories. One category is "Not Designed (Insufficient Materiel)". It is significant that 46.2% of all respondents, 50% of Concept 1 respondents, and 57.1% of Concept 2 respondents were in this category. Their reasoning directlly conflicts with the assumptions made by those identifying the "appropriately designed" category.

Two respondents identified the ATH as "Not Designed" due to the unpredictability of modern war. They referred to the variety of different weapons that may be employed against friendly forces and the resulting complexities in treating casualties. They felt the ATH Table of Allowance is not current for modern war.

Seven respondents felt the ATH is "Not Designed" due to the various locations to which an ATH may be deployed and its possible uses. For example, ATH's deployed to forward operating bases may experience a high percentage of battle casualties while one located sufficiently to the rear may primarily treat DNBI. Additionally, ATH's deployed to areas as diverse as Northern Europe, Korea, or South West Asia must not only consider differences in enemy capabilities and the types of casualties generated, but also the different environments (terrain, climate, population, insects, food and water).

If 84.6% of respondents consider the ATH sensitive to surges, it is critical to know how significant the respondents consider the possibility of a localized surge that would impact on an ATH. TABLE 4.6 shows that 84% of all respondents considered the possibility of a localized surge as either moderately, fairly, or highly significant. These three categories were selected by 93.7% of Concept 1 respondents and 71.4% of Concept 2 respondents.

The Spearman's Rank Correlation Coefficient was calculated to determine if there was a correlation between the surge sensitivity responses (TABLE 4.4) and the surge possibility responses (TABLE 4.6). The null hypothesis that there is no correlation was rejected. The test shows a positive linear relationship at the $\alpha = 0.05$ level. Test results were

CALCULATED VALUE	Ø.33Ø
CRITICAL VALUE	Ø.329
SIGNIFICANCE LEVEL	Ø.Ø5Ø

REJECT IF CALCULATED VALUE IS GREATER THAN CRITICAL VALUE

TABLE 4.7 displays responses to Question 3d. and the categories in which the researcher placed the responses. It is significant that 69.3% of the respondents' answers to Question 3c. were based on variations in the conduct of war, due either to enemy action or both friendly and enemy action. Respondents identified three possible causes of surges: 1) increases in combat activity and the resulting flow of patients to the ATH, 2) direct enemy attack on the base on which the ATH is situated, and 3) mass casualty incidences. To further explain mass casualties, two possible examples are 1) an incident resulting from a munitions dump explosion causing an overwhelming amount of shrapnel, fracture, and burn casualties or 2) a transport aircraft crash resulting in an overwhelming amount of burn patients.

One respondent thought that advance notice of possible surges would allow time to increase materiel stocks. Three others thought that the distribution of medical facilities would ensure an equitable flow of patients to different facilities, thus lessening the possibility of a surge. While these four responses address surges caused by combat activity (assuming accurate plan-

ning) they do not directly address enemy attacks on the ATH base or mass casualty incidences. Implicit in these comments are assumptions that patient evacuation is not interdicted and that other factors such as weather and terrain do not create unexpected problems.

Therefore, this research concludes ATH's are not designed for surges and that surges are likely to occur. With ATH's having the same Tables of Allowance, it becomes essential that either or both unique prepositioned materiel and unique prestocked materiel be prepared to supplement the basic ATH's.

ATH Movement

Questions 4a. and 4b. asked respondents to consider the probability of an ATH moving to another site based on casualty demand being higher than in the current location. TABLE 4.8 shows that 50% of the respondents consider the probability very low to low, while 38.5% consider the probability moderate to very high. To determine if there were differences in rankings for Concept 1 and Concept 2, the Mann-Whitney test was run. The null hypothesis that the two populations have identical probability distributions could not be rejected. The Mann-Whitney results were

	CONCEPT 1 MEAN RANK	CONCEPT 2 MEAN RANK	CALCULATED VALUE
PROBABILITY OF MOVE	12.Ø3	11.93	55.5

REJECT IF CALCULATED VALUE IS LESS THAN 26.Ø

TABLE 4.9 provides the reasoning used by the respondents in determining the probability of a move. Those respondents who thought the probability of a move was moderate to very high generally explained that the flow of batttle would determine movement. That is, if the forward edge of battle moved so far forward from an ATH that it no longer contributed to casualty management, it would also move forward. Also, if enemy action threatened take over of an ATH or interference with ATH activities, then it would likely move away from the combat area, if possible.

Three respondents selected a low probability of movement as they thought that transportation would not be available. Causes of lack of transportation suggested were 1) interdiction of air or ground movement, 2) aircraft/ trucks not available to move assets; and 3) terrain or weather problems.

Eleven respondents (42.3%) identified a low probability of movement because the mission of an ATH would result in its being located sufficiently behind the lines. This response assumes the primary reason an ATH might move would result from an enemy threat. These respondents generally thought that ATH's would usually be colocated with

a flying operation, and therefore, if the forward edge of battle moves forward, the base and its assets would not move as long as its aircraft could continue to support the mission.

Therefore, this research concludes that, for most situations, the probability of an ATH moving is low. However, if an ATH is 1) threatened by the enemy, 2) in a poor location to handle casualties, 3) involved in operations where mobility and flexibility are essential or 4) is not supporting a flying operation, then the ATH probability of moving will increase, if transportation is feasible.

Resupply

Question 5. concerned the possibility of the resupplying of ATH's from other assemblages. Twenty-four of the respondents said it was possible. However, there were various comments as to how this could be done and under what situations.

Most respondents thought it was acceptable to resupply from other assets within theater that were not currently activated. They stressed, however, that proper approval must be secured, accurate records kept, and the inactive assemblages resupplied immediately.

Most respondents also thought it was acceptable to request ATH resupply from medical assemblages that are in the maintenance mode or from operating medical facilities

that have established resupply procedures. An assemblage in the maintenance mode is one that is not operational but has a caretaker force assigned to it and has the capability to requisition materiel, similar to an operating facility. Respondents thought this should be done on an exception basis, unless plans specified this method of resupply for ATH's in which case the assemblages/operating facilities would have the logistics personnel and materiel required to meet the additional workload.

Respondents thought that resupply on the exception basis would not create significant problems for assemblages/operating facilities. They explained that the resupply requirements of an ATH would not significantly draw down the stocks of larger medical units such as 250 or 500 bed hospitals. In addition, the ATH, lacking the relatively sophisticated capabilities of larger hospitals, would find that the larger facilities could provide the needed materiel or suitable substitutes.

Therefore, this research concludes that resupply of ATH's from assets prepositioned for other assemblages, whether operational or not, or from existing medical facilities, is acceptable on an exception basis. This has implications for situations other than major war, where all prepositioned assets may not be needed for their planned purpose. An ATH, for example, involved in rapid deployment operations near a particular theater, could borrow assets

from that theater, providing action is taken to immediately replace these assets. This would lessen the prepositioning requirements for ATH's.

Unique Considerations and Prepositioning

The unique resupply considerations addressed by the respondents in Question 6. reinforced a planning directive of the medical estimate: to appraise all factors that may affect the mission.

The respondents, in general, mentioned terrain, climate, indigenous diseases, and likely type of combat (counterinsurgency, conventional, chemical/biological, tactical nuclear). They expressed concern with potential communication breakdowns resulting from enemy jamming or targeting of communications facilities. This would complicate resupply requisitioning and the coordination of patient evacuation. They were also concerned with the possibility of the various categories of patient evacuation being interdicted (battlefield, intra and inter theater).

Of particular interest to the respondents were the logistics problems of supporting operations in the Pacific and South West Asia. The materiel pipeline distances are considerable and airlift times are relatively long in comparison to other areas of responsibility. Respondents identified an overreliance on airlift, with the realization that the only form of surface transportation for these two areas is sealift, which is satisfactory for sustaining

operations but not near term resupply. Thus, each area of responsibility has unique considerations that affect the mix and quantity of medical materiel needed. In addition, pipeline time may be considerable. These two factors lead into Question 7., which addresses the prepositioning of resupply packages.

In general, the respondents believe that pre-positioning in-theater is feasible. They cautioned that prepositioning should be done in prepackaged sets or kits, not on a line-item basis, which would likely emulate a depot and generate additional problems associated with another level of depot-type operations.

Prepositioned materiel could be shipped to ATH's under a PUSH concept (shipped in time phased increments without a requisition from the receiving unit) or under a PULL concept (shipped based on requisitions from the receiving unit). The respondents preferred the PULL concept, unless communications were down, in which case they preferred the PUSH concept.

Two major problems with prepositioning were discussed by the respondents: 1) maintenance of the materiel and 2) non-rotatable losses. For maintenance, most respondents suggested placing the sets with an existing in-theater stock record account, either at an active medical facility or with one in the maintenance mode (e.g., a prepositioned 500-bed hospital with its dedicated seven man

maintenance staff and mini-computer). This would provide trained materiel personnel and allow some rotation with peacetime operating stocks. If the sets cannot be colocated with an existing account, then dedicated materiel personnel would have to be assigned to manage the sets. Respondents believe a less acceptable alternative would have teams of materiel personnel moving from location to location doing the required periodic quality control, inventory, equipment maintenance, and rotation. Another alternative suggested would involve host country civilian personnel managing the materiel under contract to the USAF.

Some respondents identified difficulties with the above alternatives. They believe that to have anything less than dedicated personnel assigned to manage prepositioned sets would lead to a conflict of interest. For example, this conflict could result from medical materiel personnel attached to an active hospital, with its daily workload and demands, being assigned the additional task of maintaining the WRM prepositioned sets. These respondents believe, based on their experience in similar situations, that the WRM would not receive the necessary attention.

Difficulties may also arise in contracting with the host-country for storage, transportation, and maintenance of the prepositioned materiel. In certain politically sensitive situations, that may not even directly involve the host country, the USAF may find that it cannot draw its

materiel out of the country. Other sensitive problems may also develop, such as labor strife, low quality work, or inadequate security.

The second major problem the respondents raised with prepositioning medical assets concerns losses that result from the non-rotatability of expiration dated and short shelf-life type items. Respondents commented that in most theaters, prepositioned materiel already greatly exceeds the amount of on-hand peacetime operating stock in use at active medical facilities. This creates difficulty in rotating the prepositioned materiel with the peacetime operating stock. Unavoidable losses of expensive medical materiel result from expiration or deterioration. Respondents considered this the "cost of doing business" with prepositioned assets.

An alternative that some respondents mentioned to the USAF managing its own assets involves the USAF entering into a joint support agreement with the Army. The Army would then manage USAF prepositioned assets, possibly through its MEDSOMS (Medical Supply Optical Maintenance Units), which operate similar to a depot.

If assets cannot be prepositioned overseas, several respondents suggested a USAF agreement with the Defense Logistics Agency (DLA), for the pre-stocking of USAF owned materiel in CONUS DLA warehouses. Management would be provided by DLA personnel. Non-rotation losses might significantly decrease as DLA could rotate the USAF materiel

with their own DLA stock. The Army already has similar agreements with the DLA. One respondent suggested this alternative as a solution to the Tactical Air Command (TAC) problem of not knowing where to preposition medical assets due to the flexibility and variety of missions with which their ATH's may be tasked. The DLA could manage TAC owned materiel in depots located on both coasts, and could rapidly prepare the sets for shipment as requested.

Therefore, this research concludes that there are unique resupply considerations that should be addressed during the medical estimate, prior to prepositioning or prestocking assets. In addition, prepositioning, either land based or maritime, may be the only feasible solution for near term resupply in areas of responsibility such as the Pacific or South West Asia. In-theater prepositioning is feasible, but it should be done in kits (not by line-item), and should be maintained by dedicated medical materiel personnel. Large non-rotatable losses would result from extensive prepositioning, but the alternative of not having the materiel when needed is unacceptable. In certain situations, either the Army or the DLA could manage USAF owned assets.

Limiting Factors

Questions 8a. and 8b. addressed limiting factors. The respondents ranked the factors in sequence starting with what they considered the most critical limiting factor. The

Mann-Whitney test was run to determine if there were significant differences in the ranking between those who selected Concept 1 and those who selected Concept 2. The null hypothesis that the two populations have identical probability distributions could not be rejected. The Mann-Whitney results were

	CONCEPT 1 MEAN RANK	CONCEPT 2 MEAN RANK	CALCULATED VALUE
1. SIZE (WEIGHT, CUBE)	13.56	8.43	31.Ø
2. COST	12.28	11.36	51.5
3. TRANSPORTATION AVAILABILITY (INTRA AND INTER THEATER)	12.81	1Ø.14	43.Ø
4. STORAGE	13.13	9.43	38.Ø
5. ADDITIONAL PERSONNEL	1Ø.81	14.71	37.Ø

REJECT IF CALCULATED VALUE IS LESS THAN 26.Ø

Many of the respondents commented on the close interrelationships between size, storage, and transportation availability. For example, as more cube and weight is prestocked, more pressure is placed on inter-theater transportation capability and on the requirement for adequate CONUS storage facilities. In contrast, as increases are made to prepositioned materiel in-theater, pressure on inter-theater transportation is reduced while the requirement for adequate in-theater transportation and storage facilities increases.

It is significant to note the identification of Transportation Availability as the number one limiting factor. Respondents recognized that competition for scarce airlift resources early in a conflict could seriously hamper near term resupply. They stressed that this increases the attractiveness of prepositioning in-theater, even though storage and personnel problems may result.

It is also significant to note the respondents identified Cost as the least limiting factor. The respondents commented that, historically, the USAF had received the medical WRM funding requested, and that this full funding trend should continue. However, the respondents did identify three areas of concern 1) future losses due to non-rotation, 2) one time and recurring storage costs, and 3) further identification of medical WRM requirements.

Non-Rotation. As previously discussed, the inability to rotate large WRM stocks with the relatively smaller peacetime operating stocks will result in significant loss of materiel and highly visible costs for replacement. As the USAF increases its WRM assets, the amount of future annual losses will also increase. While the respondents believe that USAF medical experts are willing to accept these losses as a cost of readiness, they expressed concern that funding restrictions may occur in the future as the replacement funding becomes a political ca-

sualty of the budget process. They believe this may also result in future restrictions on the funding of requests for additional (not replacement) medical WRM materiel.

Storage Costs. The second problem the respondents identified dealt with storage costs. Some respondents believe that available overseas storage is not only limited, but in many cases inadequate. They emphasized the essentiality of adequate storage for medical materiel. Most medical materiel is highly sensitive to temperature extremes, humidity, contamination (dirt, dust, rodents), and theft. The respondents believe that present inadequate storage conditions result in higher losses of materiel through accelerated deterioration. They expressed concern that this accelerated deterioration *may* affect the potency of medications, sterility, and equipment operation before the deterioration is recognized. Concern about the quality of future storage facilities was also expressed, as the respondents believe those available may likely provide an even lower quality of storage than WRM assets now receive. Thus, the respondents believe that budget presentations of medical WRM funding shortfalls should be accompanied by the costs of upgrading and/or the construction of adequate storage facilities.

Identification. The further identification of medical WRM requirements represents an area in which the respondents felt greater emphasis was required. The re-

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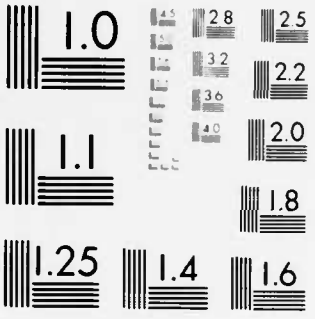

spondents generally expressed confidence that, over the past few years, estimates of USAF medical WRM requirements have become increasingly accurate. However, they felt the trend toward improvement must continue. Two problems were surfaced: 1) some medical WRM requirements have not been funded, and 2) improvement is needed in the methodology for determining the type and quantity of materiel required.

1. This section will explain why several respondents beieve that not all WRM requirements have been funded. This belief contrasts with that of most respondents, who strongly believe that all requirements are funded. Suppose, for example, Defense Guidance states that in a particular theater the USAF is responsible for the first 60 days of materiel after the beginning of a conflict (D-Day). DLA materiel responsibility would then extend from day 61 until industrial production can sustain combat requirements (P-Day). The DLA requires that the services provide wartime requirements to the DLA in three month increments, D to D-3 (D-Day through the end of the third month, day 90) and D-4 to D-6 (months four, five, and six). Because the USAF is responsible for the first 60 days of requirements, the DLA interprets the USAF D to D-3 requirements as only including day 61 to day 90. However, some USAF unfunded requirements for day 31 to day 60 are included in the D to D-3 requirements list provided to DLA.

The respondents explained that the day 31 to day 60

unfunded requirements are included in the D to D-3 list for two reasons: a) the USAF has not yet determined where to preposition this materiel (and may not have storage facilities), and b) the D to D-3 list provides a vehicle for the USAF to at least identify to the DLA the requirements needed on day 31.

a. Many WRM assemblages, such as the ATH, are designed to operate for thirty days without resupply (based on a specified population at risk and evacuation policy). The initial thirty days of materiel is colocated with the assemblage. For some assets, however, where to locate the additional thirty days of materiel has not yet been determined. The respondents stressed that, in the case of mobility assets, there are many potential deployment sites. Should assets be prepositioned near to as many of the sites as possible, with the problems and costs of overseas prepositioning? Or, should the materiel be prestocked in the CONUS? For prepositioned WRM assemblages, the question also arises as to the location of the additional thirty days of materiel. Should it be with the assemblage, and if so, is adequate storage available? Or, should it be at a nearby or central location? If so, who should maintain it and is adequate storage available?

b. The respondents explained that by placing the day 31 to day 60 requirements in the DLA D to D-3 list, the USAF has identified to the DLA that the requirements exist, and

are needed on day 31. The DLA can then take action to ensure that the materiel will be available.

Respondents believe the current procedures represent movement in the right direction. However, they express concern that known WRM requirements have not yet been funded and that even though identified, the materiel may not be available where it is needed on day 31.

The second problem discussed by the respondents relating to further identification of WRM addressed the present methodology for determining the type and quantity of materiel needed for resupply. For example, the basic Table of Allowance (TA) for an ATH provides a listing of materiel for thirty days of operation. An algorithm developed to compute requirements for the next thirty days is applied to the ATH Table of Allowance. This algorithm takes into account the population at risk and expected casualties for a major war (worst case scenario). The computation results in materiel requirements for 30 additional days of operations. Slight modifications of the basic algorithm permits computations for day 61 to day 90, day 91 to day 120, continuing as far as projections are needed.

While respondents expressed confidence in the algorithm and its application, they were concerned with the currency of the TA. Some respondents remarked that the TA was initially developed years ago, and that despite periodic revisions, they believe it is still not adequate to meet

casualties resulting from modern warfare. They further explained that computations based on the current TA will result in inadequate resupply sets.[3]

Therefore, this research makes the following conclusions concerning limiting factors. 1) Transportation is the primary limiting factor. This increases the attractiveness of prepositioning in-theater. 2) Even though respondents considered cost the limiting factor of least concern (based on past experience), it may become a more significant limiting factor as non-rotation losses and storage costs begin to increase. 3) Some USAF medical WRM is identified but unfunded. 4) The current methodology for determining resupply requirements is based on a worst case scenario (as opposed to specific operational plans), provides thirty day increments (not really time phased), and is dependent on a TA that may not be valid for modern warfare.

Limiting Factors and Situations

TABLE 4.12 shows how the respondents ranked the various limiting factors for each situation they identified as possible (Question 9a.). The rankings were similar for the three wartime situations, with Transportation considered

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[3] There currently are plans to expand ATH's from 24 to 48 bed facilities. The new TA has been developed and does include further revisions to the basic TA. However, the respondents were not aware of the assumptions made or the extent of the revisions in the new TA.

most significant and Cost least significant. This was consistent with the findings from Question 8a. However, the rankings between the questions for second, third, and fourth were somewhat different. Respondents explained this difference in that for Question 8a. they addressed the ranking problem from a broad, general perspective. However, when ranking for Question 9a., they considered the ATH as operational under specific situations. This also explains why the rankings for peacetime situations are somewhat different. In particular, Cost moves from least significant to a middle rank.

The Mann-Whitney test was run on the total rankings for each of the five situations. The situations were categorized by whether the respondent selected Concept 1 or Concept 2 in response to Question 11. The null hypothesis that the two populations have identical probability distributions could not be rejected. The Mann-Whitney results were

	CONCEPT 1 MEAN RANK	CONCEPT 2 MEAN RANK	CALCULATED VALUE
LIMITED WAR	11.44	13.29	47.0
MAJOR WAR	12.84	10.07	42.5
RAPID DEPLOYMENT OPS	11.28	13.64	44.5
NATURAL DISASTERS	12.75	10.29	44.0
EXERCISES	12.16	11.64	53.5
OPERATIONS	12.66	10.50	45.5

REJECT IF CALCULATED VALUE IS LESS THAN 26.Ø

Therefore, this research concludes that during wartime, Transportation remains the number one limiting factor and Cost remains the least significant. However, when the ATH is activated for peacetime uses, Cost increases from least significant to a middle rank.

Resuppply Without Communications

In general, the response to Question 9b. was to recommend a PUSH type system. The respondents commented that the PUSH could originate from a central in-theater source of prepositioned materiel or from a CONUS source of prestocked materiel. If originating from the CONUS, the materiel could be in already prepared sets or be on DLA shelves by line items. If managed by line item, the DLA would respond to "precut" or "preplanned" requisitions made by the services. Ideally, the services would notify the DLA well in advance of what these requirements are so that the DLA could procure and stock the long lead time materiel, if necessary.

Some respondents suggested that, for mobility assets, to ship the resupply packages when the unit deploys. If this is not possible, they suggested shipping the resupply packages as soon as feasible after the unit deploys.

Several respondents also mentioned that attrition, or loss of materiel due to enemy action, may be a problem. If this is expected, they recommend that prepositioned or

prestocked materiel over and above the baseline requirements be considered.

Respondents did consider two drawbacks of the PUSH concept. One is that materiel that is not needed by the operating unit may be shipped and eventually become excess, or, items that are needed may not be shipped or shipped in insufficient quantities. The second drawback is that if items are shipped that are not needed, or shipped significantly in advance of when they are needed, then critical transportation assets will have been used in a suboptimal manner.

Therefore, this research concludes that the PUSH concept provides the most feasible method of resupply when communications are not available. The PUSH may come from in-theater or CONUS. If from CONUS, the materiel could be in prestocked packages or managed by the DLA on a line-item basis. PUSH should be planned and executed carefully so that the correct materiel is shipped when needed.

Personnel

Question 1Ø. addressed the problem of acquiring trained medical logistics personnel to maintain the increasing quantities of WRM. In general, the respondents expressed concern that overseas manpower shortages may already be resulting in less than adequate maintenance of current WRM. The respondents provided the following suggestions:

1. Place additional WRM with already existing stock record accounts. With this suggestion, both trained personnel and computer support would be available. However, the respondents believe that if additional personnel are not assigned to assist with the increased workload, it is likely that assigned personnel will emphasize their primary task of supporting the active medical facility rather than the WRM programs. They explained that during peacetime, pressure is placed on medical logistics personnel to meet the most acute suspenses, which invariably deal with supporting the active peacetime operation.

2. Place additional WRM with programs such as pre-positioned 500-bed hospitals, which for example, have seven personnel and a mini-computer assigned. However, the respondents felt that not only will personnel tend to emphasize their primary duties to the detriment of the additional WRM, but they also expressed reservations that the seven personnel assigned may not even be able to provide adequate maintenance for their primary responsibility, the 500-bed hospital.

3. Increase the number of trained medical logistics personnel. The respondents' suggestions included reallocating spaces from existing Air Force Specialty Codes (AFSC's) to the medical logistics AFSC (915X0), waiving current Career Job Reservation ceilings so that experienced 915X0 personnel will not be forced to cross train or leave

the USAF, and cross train personnel into the 915X0 field. Respondents noted that these suggestions require changes to the current 915X0 education programs to ensure personnel have the basic skills required for maintaining and inspecting WRM, including the use of the new mini-computer and also existing computer programs for WRM management.

4. Some respondents suggested creating a specialty identifier for medical logistics personnel with expertise in WRM management. One difficulty they mentioned, however, is that almost all assignments for these personnel would be at overseas locations. This imbalance could result in the AFSC being considered undesirable and may also adversely affect morale.

5. Assign personnel on a rotating temporary duty (TDY) basis. The respondents presented this as a short term fix, explaining it was not a feasible long term solution.

6. Enter into support agreements with the DLA for CONUS management of USAF materiel. The respondents explained that this would free some trained medical logistics personnel from the task of managing these assets and permit their assignment elsewhere. The impact would be limited since most materiel may eventually be prepositioned outside of the CONUS.

7. Contract with host-country personnel for WRM management. The respondents stressed that this is only feasible in countries where civilian personnel are reliable,

honest, and can be depended on during a crisis.

8. Identify the additional workload to the local Management Engineering Team (MET) with the goal of generating peacetime additives. While this seems feasible, respondents who have participated in this process have found that even though their requirements were validated, their requests for additives were not approved.

9. When requesting funding for a WRM program, also request the additional personnel. This has worked for assemblages such as the 500-bed prepositioned hospital. The respondents believe the manpower problem is most severe however, for additional WRM, not new WRM programs. They explain that it has been the steady growth of existing programs without the requisite growth in manpower that has created problems. Adding WRM such as ATH resupply packages will only aggravate the problem.

10. Tailor the acquisition and prepositioning of materiel to the availability of personnel. Respondents suggesting this felt that without sufficient personnel, the materiel could not be properly managed, resulting in losses of a greater magnitude than expected. An alternative would be to acquire and preposition only the materiel requirements that did not require intensive management. This would not stress existing manning as much. Once additional personnel were available, the more manpower intensive materiel could be procured and prepositioned

Therefore, this research concludes that the acquisition of trained medical logistics personnel is a significant problem for existing WRM programs. It is not as severe for newly created programs for which manpower was identified and requested concurrently with the program funding request. It is essential that 915X0 additives be approved. Training programs would then need to expand to meet the projected influx of personnel. Training would need to emphasize the special skills required for WRM management. Reallocation of spaces, waiving Career Job Reservation restrictions, and encouraging cross-training into the 915X0 field are valid suggestions. On a limited basis, the DLA could manage materiel in the CONUS and some host-country maintenance contracts could be authorized for overseas locations. On a short-term basis, materiel that is not manpower intensive could be procured and prepositioned. The remainder of the required materiel would not be procured and prepositioned until personnel are available.

Research Question 2

What are the strengths and weaknesses of the proposal to replace 100% of what has been used?

The proposal in this research question is referred to as Concept 1 in the interview questions. Interview Questions 11. and 12. addressed this research question.

In Concept 1, a resupply package would be designed

to replace what planners project will have been used in the time period prior to arrival and use of the resupply package. This would result in the ATH stock levels remaining at 100% (less on order/intransit).

TABLE 4.13 shows that sixteen respondents, or 61.5%, selected Concept 1. Of these sixteen, seven (43.8%) ranked their selection as very much better, five (31.3%) ranked their selection as slightly better, and four (25%) ranked their selection as almost equal to any other alternative, as shown in TABLE 4.14.

In general, respondents selecting Concept 1 commented that the planning procedure, and the assumptions on which plans are based, make it difficult to plan materiel use with a high degree of accuracy. They believe that if USAF casualties are inversely proportional to the days of operation, then Concept 1 would provide somewhat of a buffer if the actual casualty rate does not match the predicted casualty rate.

The respondents believe this buffer may prove essential for two reasons. One being that the higher stock levels of materiel would provide a cushion against an unexpected surge. The other reason being that the ATH may likely be involved in joint operations in which the different services may experience casualties at different times.

Several respondents suggested that the idea of keep-

ing the ATH levels at 100%, rather than letting them decline as the casualty rate declines, should continue as a goal even after normal resupply begins. This would result in ATH's ready to redeploy, if needed, almost as soon as requested.

Therefore, this research concludes that 61.5% of the medical logistics and planning experts interviewed felt that resupply packages should be designed so that ATH stock levels remain at 100%. It is difficult to plan materiel use with a high degree of accuracy. In addition, unexpected surges or other than USAF casualties may occur. Finally, if levels are brought up to 100% after resupply, the ATH will be ready to redeploy.

Research Question 3

> What are the strengths and weaknesses of the proposal to resupply based on expected demand?

This proposal is referred to as Concept 2 in the interview questions. Rather than replacing what planners project will have been used in the previous period, this concept calls for resupplying based on what will be used in the future. With the assumption of a declining casualty rate, this concept will result in ATH stock levels declining.

TABLE 4.13 shows that seven respondents, or 26.9% of the total, selected Concept 2. Three (42.9%) ranked their

selection as very much better and four (57.1%) ranked their selection as slightly better (as shown in TABLE 4.14).

The Mann-Whitney test was used to determine if those who selected one concept had more confidence in their choice than those who selected the other concept. The null hypothesis that the two sampled populations have identical probability distributions (relatively the same amount of confidence) could not be rejected. The Mann-Whitney results were

	CONCEPT 1 MEAN RANK	CONCEPT 2 MEAN RANK	CALCULATED VALUE
CONFIDENCE IN DECISION	12.47	10.93	48.5

REJECT IF CALCULATED VALUE IS LESS THAN 26.0

In general, the respondents selecting this concept expressed confidence in the validity of the historical data used to project the declining casualty rate. They thought that after the initial surge in casualties (the peak requirement) that the ATH level of activity would become relatively low and predictable.

As previously mentioned, several of the respondents believe the ATH was designed to handle surges. These respondents all selected Concept 2. They commented that the ATH is already "overdesigned" and to resupply with a buffer in mind would result in overstocking.

As these two proposals are essentially PUSH concepts, respondents who selected Concept 2 emphasized that there exists, with Concept 1, a greater likelihood of excess materiel being shipped to the theater and becoming a storage problem than with Concept 2. In addition, Concept 1 may also result in using scarce airlift resources to move unnecessary materiel.

The respondents also felt that resupply packages under Concept 2 would be smaller and therefore cost less, be easier to maintain, require less storage space, and use less of the weight and cube capability of transportation resources than Concept 1 packages. They expressed concern that if cost becomes a significant limiting factor, then to fund Concept 1 might restrict funding in other WRM programs.

Therefore, this research concludes that 26.9% of the respondents believe that resupply packages should be designed based on expected demand. Based on conclusions reached earlier in this research, the assumption that ATH's are designed to handle surges and that surges are unlikely is probably not valid, and if so, fewer respondents would probably support Concept 2. Concept 2 would result in smaller packages, lower costs, and be less of a burden on transportation and storage assets than Concept 1.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Chapter Overview

This chapter summarizes the conclusions that can be drawn from this study of factors that impact on the wartime resupply of Air Force air transportable hospitals. Recommendations as to the approach to be used in determining how that resupply may be accomplished are made, and recommendations for further research are suggested.

Specific Conclusions

Conclusions were discussed in detail for each research question in Chapter IV. Following is a summary of these conclusions:

1. The respondents generally agreed that the most likely use of an ATH would be in non-combat type situations. Historically, such non-combat situations as natural disasters have been isolated in nature. The respondents emphasized that non-combat situations do not present significant resupply problems nor do they significantly stress limiting factors such as transportation availability. Therefore, the remainder of this chapter will address war-

time resupply, which is the purpose of this study.

2. Transportation is the primary limiting factor. With airlift the predominant mode of transportation for near term resupply, cargo capacity is severely constrained. This enhances the concept of prepositioning resupply packages as near as possible to the point of projected use. Either land based or maritime prepositioning is acceptable. Prepositioned materiel should be stored as packages or kits, not on an individual line-item basis. This would ensure the packages are ready for shipment and would also prevent the creation of a depot type operation with its potential problems. Maintenance of prepositioned materiel should be done by dedicated, experienced personnel. The amount of materiel prepositioned within an Area of Responsibility should be limited to that materiel which, in a worst case scenario, would be needed until normal resupply is established. Because medical WRM stocks are relatively large in comparison to peacetime operating stocks, the rotation of expiration dated and short shelf life items will be limited. This will result in large and politically visible losses of materiel and the follow-on requests for funds to replace the materiel. The large losses and resulting costs of replacement should be considered and accepted as one of the costs of readiness. The unique resupply considerations identified in the medical estimate should be considered when determining materiel to be prepositioned (or prestocked).

3. Resupply for ATH's can come from materiel pre-positioned for other assemblages (whether operating or not) or from an existing facility. This should only be done on an exception basis, with immediate action taken to replace the requisitioned materiel. This could result in reduced prepositioning requirements for limited actions such as Rapid Deployment Operations, where emergency resupply could come from prepositioned assets in an adjacent Area of Responsibility.

4. A potential problem in resupply could result from the garbling or loss of communications due to enemy jamming or destruction of communication facilities. If this occurs, the most feasible method of resupply is by PUSH. The PUSH could come from either in-theater assets or from prestocked materiel in the CONUS. If from the CONUS, the materiel could be either in package form or managed by the DLA on a line-item basis. "Preplanned" requisitions would be transmitted to the DLA as needed.

5. The respondents generally thought that the probability of an ATH moving from its initial site is low. Therefore, once the ATH is established, large amounts of materiel can be shipped to the ATH without the concern of having to repack and move the materiel shortly after receipt.

6. The acquisition of trained personnel is a significant problem for existing WRM programs. Validated requests for manpower additives for medical logistics personnel have not been approved. As a result, WRM programs are not receiving the attention required. The problem is not as severe for new programs such as the 500-bed hospital, in which personnel were requested concurrently with the request to fund the materiel.

7. At the present time, cost is the limiting factor of least concern. However, it may soon increase in significance. There are some medical WRM requirements that have been identified but have not yet been funded. Most respondents were not aware of this situation. Also, the impact of non-rotation losses and the resulting replacement costs will gradually increase to a high level of expense and political visibility. Finally, the current methodology for determining medical WRM requirements, while constantly being improved, considers worst case casualty estimates rather than by Operation Plan (OPLAN), is in 30 day increments (not really time phased), and is dependent on a Table of Allowance that may not be valid for modern warfare. These problems are currently being worked, and once resolved, may result in significant funding requirements.

8. Most respondents believe that the ATH is sensitive to surges. However, three respondents believe that

it is designed to handle surges. Because the interview respondents are influential logisticians and planners, this discrepancy concerning sensitivity could result in errors being made in the employment of ATH's. This could result in either the inability to treat casualties or procurement and shipment of excess materiel, depending on whether the ATH is or is not designed to handle surges. Additionally, the respondents generally agreed that surges were likely to happen and that it is difficult to plan materiel use with a high degree of accuracy.

Recommendations

The following recommendations are offered for consideration in future efforts to determine how to accomplish wartime resupply of air transportable hospitals.

1. To develop resupply procedures, medical logisticians must address individual OPLANS. Each OPLAN considers workload requirements, daily admission rates, daily bed requirements, and aeromedical evacuation requirements based on Time Phased Force Deployment Data (TPFDD), generation rates, accumulation factors, and dispersion factors. The OPLAN workload requirements allow logisticians to evaluate the expected casualty data and to plan resupply based on the materiel required to treat those casualties, on a time phased basis. Thus, logisticians need to plan resupply for individual OPLANS, rather than on a worst case

scenario.

2. The basic Tables of Allowances (TA's) must be made current to treat the type of wounds that will be generated by modern warfare. Once the TA's are updated, logisticians will be able to run individual OPLAN workload requirements against the TA's to determine the additional materiel requirements for prepositioning or prestocking for each OPLAN.

3. The updating of individual TA's and the generation of actual materiel requirements should consider using the Sets, Kits, and Outfits model developed as part of the Tri-Service DOD Deployable Medical Systems Standardization Project. This model provides per patient data including the number of each type of casualty. Each casualty is taken through the 4E concept and the treatment provided at each echelon is determined. The result is the identification of the type and quantity of materiel that is required at each echelon of care. This model is currently being evaluated for approval and implementation by the USAF (6).

4. Prepositioning and prestocking should be based on each specific OPLAN. This information would enable logisticians to determine how the previously referenced identified but unfunded WRM should be managed. Once this is done, the materiel can be funded and procured.

5. The difference in perceptions as to the relative sensitivity of the ATH to surges must be resolved. The current or revised TA's will probably remain in use until they are updated, possibly by the Sets, Kits, and Outfits model. Once they are updated, if changes are significant, it could be several years before the upgrade is complete. Therefore, the perception problem is of practical significance.

6. Validated requests for WRM manpower additives must be approved. The training program for medical logistics personnel must be expanded to meet the influx of personnel and the program should emphasize the special skills needed for WRM management. Manpower spaces should be reallocated to 915X0's, Career Job Reservation restrictions should be waived, and cross training into the 915X0 field should be officially encouraged. On a short term basis, materiel that does not require manpower intensive management can be procured. Procurement of materiel that requires intensive management should be held in abeyance until manpower is available to manage it.

7. Further research needs to be conducted concerning the integration of the Sets, Kits, and Outfits model with the medical planning system and the Joint Operation Planning System. The full capabilities of the model need to be explored and applied to actual data.

APPENDIX

Interview Package

DEPARTMENT OF THE AIR FORCE
AIR FORCE INSTITUTE OF TECHNOLOGY (ATC)
WRIGHT-PATTERSON AIR FORCE BASE, OH 45433

20 JUN 1983

REPLY TO ATTN OF: LSM (Maj Rastetter/55023)

SUBJECT: Interview Concerning Concept of Resupply for Air Transportable Hosptials
Scheduled Date:
Time:

TO

1. Thank you for agreeing to an interview concerning the concept of resupply of Air Transportable Hospitals. As we discussed during our telephone conversation, this interview will contribute to research I am conducting at the Air Force Institute of Technology, Wright-Patterson AFB, Ohio. The research is sponsored by the Air Force Medical Materiel Field Office, Ft. Detrick, MD, and the results will assist in determining a resupply concept.

2. I have attached a list of questions that we will discuss during the interview. Prior to the interview, you may want to review the list and write down any thoughts or ideas you have. Also, you may want to annotate the list during the interview.

3. In order to ensure the validity of the research, I will need to collect information on your career background. A list of the information requsted is attached. If you desire anonymity, please inform me when I call for the interview. All responses will be treated as confidential, and no individuals or organizations will be identified in the use of this material unless you give specific written permission to do so.

4. Also attached are several definitions of terms that will be used in the interview. They are provided to ensure all interviewees are using the same definitions for those terms.

5. I am looking forward to our interview at the date and time specified above. Thank you for your help.

Jeffrey W. Cooper

JEFFREY W. COOPER, Capt, USAF
MSC

3 Atch
1. Definitions
2. Interview Questions
3. Background Information

1st Ind, LS

1. Your assistance in this interview will provide important support for United States Air Force planning and the Air Force Institute of Technology educational mission.

2. Thank you for your willingness to participate and for your contributions to this research.

Larry L. Smith

LARRY L. SMITH, Colonel, USAF
Dean
School of Systems and Logistics

DEFINITIONS

1. Air Transportable Hospital (ATH): An ATH is a complete medical treatment facility designed for immediate airlift which, once unloaded at its destination, can become fully operational within eight hours. It has 24 or 48 beds and one operating room (two operating tables) for resuscitative surgery. Medical and dental care provided is in accordance with an evacuation/return to duty policy of two to fourteen days. With 48 beds, its staff can perform 12 major surgeries and accommodate a peak of 20 admissions and limited/definitive outpatient care for 50 patients each day. After patient evacuation, the unit can relocate and reestablish in 24 hours, less travel time. An ATH is capable of all weather, combat zone operation and requires external support services.

2. Many different feasible concepts of resupply for ATH's have been proposed, and more may be developed. Two concepts will be defined here, but they are not meant to be exclusive. Please provide any comments, criticisms, or additional proposals that you feel are appropriate. The two defined concepts are

   a. Design the resupply package to replace what has been used. This will result in the ATH stock levels remain-

ing at 100% (less on order/intransit).

b. Design the resupply package to meet the demand rate planners expect for a specified period of time after the ATH receives the resupply package. Because the heaviest demands on the medical system historically occur at the initiation of hostilities and then steadily decline, this concept will result in stock levels being replenished at less than 100%.

INTERVIEW QUESTIONS

Following are the questions that we will discuss when I contact you for our telephone interview. I have left space after each question for you to make notes, both prior to and during our interview, if you so desire.

Interview Question 1.

In what type situations will ATH's be used? Circle the appropriate situations. Please add any other situations in which you feel an ATH may be used.

a. Limited War

b. Major War

c. Rapid Deployment Operations

d. Natural Disasters

Other (please explain)

e.

f.

g.

ATCH 2

Interview Question 2.

2a. By rank order, which of the situation types that you identified in Question one are more likely to occur than others?

RANK	SITUATION TYPE
	a. Limited War
	b. Major War
	c. Rapid Deployment Operations
	d. Natural Disasters
	Other (your definition in question one)
	e.
	f.
	g.

2b. Please explain why you ranked the situation types as you did.

2c. Do you have any other comments?

Interview Question 3.

3a. Casualty rate is inversely proportional to the days of operation (from the time of initiation of hostilities). However, there is considerable variation within a conflict. How sensitive are ATH supplies to localized surges in demand (within-conflict variation)? Please circle the number of your response.

1. NOT SENSITIVE

2. SLIGHTLY SENSITIVE

3. MODERATELY SENSITIVE

4. FAIRLY SENSITIVE

5. HIGHLY SENSITIVE

6. NO OPINION

3b. Please explain why you selected the sensitivity category that you did.

3c. How significant do you consider the possibility of a localized surge? Please circle the number of your response.

1. NOT SIGNIFICANT

2. SLIGHTLY SIGNIFICANT

3. MODERATELY SIGNIFICANT

4. FAIRLY SIGNIFICANT

5. HIGHLY SIGNIFICANT

6. NO OPINION

3d. Please explain your response to 3c.

Interview Question 4.

4a. Once in place, what is the probability that the ATH will be required to move to another site based on casualty demand being higher than in the current location? Please circle the number of your response.

1. VERY LOW

2. LOW

3. MODERATE

4. HIGH

5. VERY HIGH

6. NO OPINION

4b. Please explain your response to 4a.

Interview Question 5.

Could the ATH be resupplied from materiel prepositioned for other assemblages (such as prepositioned 500-bed hospitals)? If so, under what conditions and from what assemblages could this be done?

Interview Question 6.

If the ATH's that are assigned to specific commands such as PACAF, USAFE, or TAC have "most likely" scenarios that will require unique resupply considerations, what are the scenarios and what are the unique resupply considerations?

Interview Question 7.

Is it feasible to preposition resupply packages closer to the expected conflict area (other than CONUS)? If so, where should they be prepositioned and who should assume responsibility for their maintenance?

Interview Question 8.

8a. Identify the limiting factors affecting resupply packages and their impact on ATH resupply. By rank order, which factors are most critical?

RANK	LIMITING FACTOR
	a. Size (cube, weight)
	b. Cost
	c. Transportation availability (intra and inter theater)
	d. Storage (location, temperature and humidity control, available space, materiel handling equipment, special storage requirements such as refrigeration, and security).
	e. Additional medical logistics personnel
	Other (please describe)
	f.
	g.
	h.

8b. Please explain why you ranked the factors as you did.

Interview Question 9.

9. Certain situations may exhaust materiel quicker than others.

9a. Using the matrix below, relate how significant each limiting factor (Question 8) is for each situation (Question 1). Indicate your level of concern by placing the appropriate letter (L=low, M=moderate, H=high, N=none) into the block that corresponds to each combination of situation and limiting factor.

LIMITING FACTOR / SITUATION	SIZE	COST	TRANS. AVAIL.	STORAGE	PERSONNEL	OTHER 1-2-3		
LIMITED WAR								
MAJOR WAR								
RAP.DEPL.OPS.								
NATL. DISAS.								
OTHER 1								
OTHER 2								
OTHER 3								

9b. Since the concern is with the period prior to the beginning of normal resupply operations, if communications are not available/reliable, how should resupply be accomplished?

Interview Question 10.

10a. How will trained personnel, to maintain the resupply packages, be acquired for the short term (one to three years)?

10b. How will trained personnel be acquired for the long term?

Interview Question 11.

Considering your answers to all the preceding questions, which of the two concepts, or another alternative, would you select for ATH resupply?

Concept One: Design the resupply package to replace what has been used. This will result in the ATH stock levels remaining at 100% (less on order/intransit).

Concept Two: Design the resupply package to meet the demand rate planners expect for a specified period of time after the ATH receives the resupply package. Because the heaviest demands on the medical system historically occur at the initiation of hostilities and then steadily decline, this concept will result in stock levels being replenished at less than 100%.

Alternative (please describe)

No Opinion

Interview Question 12.

12a. How much better is your selected alternative than the other alternatives listed in Question 11? Please circle the number preceding your answer.

1. VERY MUCH BETTER

2. SLIGHTLY BETTER

3. ALMOST EQUAL

12b. Please elaborate and describe the criteria you used to distinguish your selected alternative from the others.

Interview Question 13.

Please provide any additional comments that you feel might be pertinent to this study.

BACKGROUND INFORMATION

In order to support the validity of this research, information on the background and qualifications of the interviewees must be collected. This information will be for documentation and support and will not appear in the report.

1. Name:

2. Grade:

3. Current Assignment

   a. Title:

   b. Responsibilities:

4. Preceding Assignment

   a. Title:

   b. Responsibilities:

5. Do you have any experience with the exercise or use of War Reserve Materiel? Please explain.

6. Do you have any combat or field experience in the areas of health care or logistics? Please explain.

7. Is there any other information on your background or qualifications that you would like to provide that may support the validity of your input? Please explain.

ATCH 3

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